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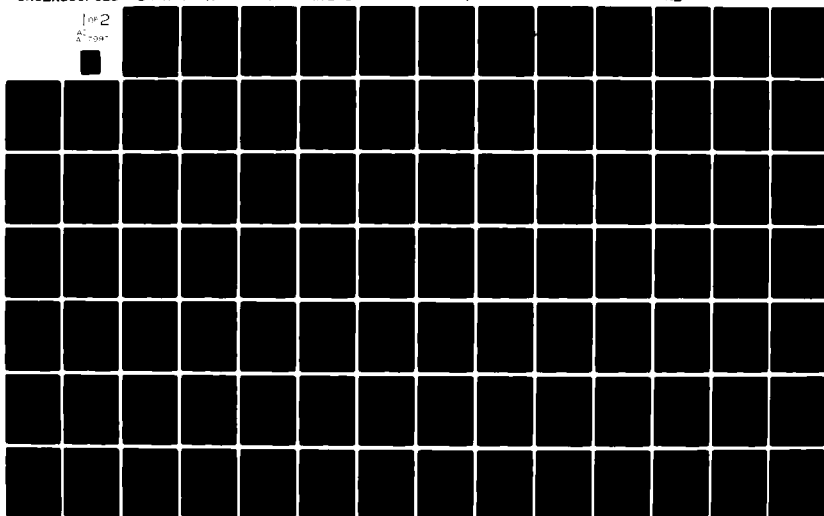
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RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)
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SM-ALC/MME-TR-79-54-VOL-1

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SM-ALC/MME-TR-79-54,- Volume I

18 December 1979



RESULTS OF A SURVEY
SOFTWARE DEVELOPMENT PROJECT MANAGEMENT
IN THE U.S. AEROSPACE INDUSTRY

VOLUME I

COMPANY ENVIRONMENT, ORGANIZATION AND PROCEDURES

JOHN H. LEHMAN
CALIFORNIA STATE UNIVERSITY
SACRAMENTO, CA 95819

AND

RICHARD H. THAYER
SACRAMENTO AIR LOGISTICS CENTER
AIR FORCE LOGISTICS COMMAND
MCCLELLAN AFB, CA 95652

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ABSTRACT

RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN THE U.S. AEROSPACE INDUSTRY

Volume I: COMPANY ENVIRONMENT, ORGANIZATION AND PROCEDURES

BY

JOHN H. LEHMAN AND RICHARD H. THAYER

This report contains the results of a survey conducted in 1977 and 1978 on how the U.S. Aerospace Industry manages its software development projects. The sample of the U.S. Aerospace Industry that was surveyed consisted of those firms and companies with a membership in the AIAA Technical Committee on Computer Systems. These committee members represented 47 major corporations or major corporation subdivisions and occupied top positions in software management within their firms.

The survey used a rather lengthy questionnaire containing 225 numbered questions, however approximately 1,328 separate responses were possible. The survey was divided into three parts. Part One deals with defining the total organization, management structure, requirements, and philosophy of the firm and was intended to be answered by top management to provide the backdrop against which the individual projects would be viewed. Part Two concerns questions about individual projects which were aimed at, and intended to be completed by, the project manager. Part Three was primarily designed to obtain the opinions and perceptions of the project managers developing software on how they viewed major issues and/or major projects of software engineering project management.

This paper reports on only a portion of the answers to the questionnaire - Part One, the project environment. The other portions - dealing with the actual projects, and software development problems - are reported in Volumes I and III.

The answers have been condensed and/or coded and recorded on a tabulation sheet in this report. In addition, the narrative portion of the survey is recorded in clear text with all references to individuals and/or their companies deleted. This report does not attempt to analyze or come to conclusions about the data, only to report it as clearly as possible.

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SECTION 1

RESULTS

BACKGROUND

In the spring and summer of 1977, a survey was conducted on the U.S. Aerospace Industry to determine what management techniques and procedures they were employing in software development projects. It was originally accomplished to collect data for analysis and the preparation of a paper on Software Engineering Project Management, to be presented at the American Institute of Aeronautics and Astronautics (AIAA) Conference, Computers in Aerospace, 31 Oct-2 Nov 1977.

The sample of the U.S. Aerospace Industry surveyed consisted of those firms and companies with a membership in the AIAA Technical Committee on Computer Systems who were hosts to the conference. These committee members represented 47 major corporations, or major corporate subdivisions, and occupied top positions in software management within their firms. They were, therefore, in an ideal position to report on how their segment of the U.S. Aerospace Industry managed its software development projects.

Initial contact was made in May 1977 to determine which members of the committee would be interested, willing, and able to participate. Forty-five members, representing 35 companies, agreed to respond. The initial draft of the survey was completed in June 1977 and critiqued by approximately 25% of the total committee membership. The results of this critique, along with other corrections, were incorporated into the final survey. The survey was mailed 10 August 1977. On 6 September 1977, with 29 of the completed surveys on hand, the authors of the survey wrote the first report for the proceedings of the Conference, Computers in Aerospace. This paper can be found in the Conference Proceedings, A Collection of Technical Papers. By the time the actual presentation was

given on 1 November 1977, questionnaires from 33 companies representing 55 projects had been received. These companies, predominantly aerospace firms with government contracts, reported mostly on large to very large projects. The presentation given (called Report Nr 2, AIAA Project Management Survey) differed from the paper in so far as it used the more complete data and a different approach.

The survey did not end there, for completed forms continued to arrive until, by the summer of 1979, 66 projects representing 38 firms for a 86% return rate had been received (see Appendix A for a list of participants). A decision was made by the AIAA Technical Committee on Computer Systems to make further use of the data by writing an assessment paper on the state-of-the-art in software development project management. Mr Gene F. Walters, General Electric Co., Command and Information Systems, Sunnyvale, California and Mr Jack E. Bloodworth, Boeing Aerospace Company, were given primary responsibility for this paper. In addition, the Rome Air Development Center (RADC), the Boeing Aerospace Company and the Sacramento Air Logistic Center offered their services, and in some cases the services of their company's data processing capability to reduce and analyze the data.

The remaining problem was to reduce the data into a form useable by a computer. This involved "coding" the narrative and free form answers of the survey and verifying their consistency.

PURPOSE OF SURVEY

As previously stated, the purpose of this survey was to look at a sample of the U.S. Aerospace Industry through the use of a questionnaire to determine how they managed software development projects.

Specifically, the questions that the survey attempted to answer were:

1. What are the current practices in Software Engineering Project Management today?
2. Are the new developments in management, i.e., "modern" management techniques or project management techniques, being used?

3. What are the trends in Software Engineering Project Management?
4. What are the relationships between Software Engineering Project Management techniques and successful delivery of software?
5. What are the relationships between various parts of Software Engineering Project Management as a system?
6. What are the relationships between "modern" Software Engineering techniques and Software Engineering Project Management?

THE SURVEY

The approach taken in determining answers to these questions was to first design a model for software engineering project management as a system and define the elements of that model and the relationships between these elements, and second, develop a questionnaire around this model using the various elements and/or variables as questions and possible responses. The survey contained 225 numbered questions and, by use of "questionnaire packing techniques," allowed for approximately 1,328 separate responses.

The survey, which contained 72 pages, was divided into three parts. Part One dealt with defining the total organization, management structure, requirements, and philosophy of the firm and was intended to be answered by top management to provide the backdrop against which the individual projects would be viewed. Part Two concerned questions about individual projects and was intended to be completed by the project manager. Part Three consisted of general questions, not project specific, calling for evaluation, opinions, and suggestions on the major problems of software engineering project management. It was also intended to be completed by a project manager.

PURPOSE OF THIS REPORT

This paper has been prepared to report the answers to Part One of the questionnaire in "raw" form so that they may be entered into a computer data base as well as to satisfy the many requests received from the computing community for access to the data collected as a result of this survey. The answers to Part Two, Part Three are provided in Volumes II and III.

Because of the restrictions placed by the participants on the use of their submissions, the actual completed surveys cannot be distributed and have been destroyed. This report was selected as a means of documenting and capturing as much of the "raw data" as possible without any possibility of revealing its source. In essence, this report does not contain "raw data" but reduced data in abbreviated and coded form that efficiently separates it from its source while allowing interested computer scientists its use for their own requirements.

This report does not attempt to analyze or come to conclusions about the data, only to report it as clearly as possible. Only minimum interpretation was made to enable the answers to be tabulated for eventual analysis. Although 38 companies reported (on 66 projects) only 34 Part Ones are reported: One company was too small and did not fit the norm, one company did not report a Part Two or Three, and two companies did not report a Part One.

CONTENTS OF THIS REPORT

As already stated, the purpose of this report is not to analyze the data from the AIAA Project Management Survey, but to report it as simply and accurately as possible, and to keep within the original ground rules of maintaining anonymity of the participants. Section 2 contains the questions and answers to this survey and Section 3 contains cited references. The participants in the survey are listed in Appendix A.

A duplicate copy of the questionnaire is in Appendix B. The questionnaire is included to allow the reader easy access to the questions and predefined answers to provide a ready familiarity with the type of material covered.

Appendix C contains the abbreviations used in reporting the narrative portions of this survey. Since the reduction of comments to code destroyed some of the richness of prose, the author felt it worthwhile to include the actual responses and these are recorded in Appendix D. To maintain the concept of protecting the participants' identity, the narrative answers cannot be tied to any project reported in Section 2.

THE FUTURE

This survey is, as far as the author can determine, the first attempt to query an industry on such a large scale to discover how their software engineering projects are managed. A look at the list of contributors in Appendix A will attest to the significance of this base of answers. The tremendous volume of data collected and the excellence of the responses dictates that this store of information be made available as reference material for papers, reports, texts, and other technical publications which might benefit the U.S. Aerospace Industry or the data processing community at large. The AIAA Technical Committee on Computer Systems is anticipating the preparation of an assessment paper on industries management of software engineering projects. This committee welcomes suggestions from the computing and aerospace communities on how to best use this data for the benefit of all. Suggestions should be sent to either:

Mr Gene F. Walters
Mgr, Software Technologies
Information Systems Programs
General Electric Company
1277 Orleans Drive
Sunnyvale, CA 94086
(408) 734-4980

Mr Jack E. Bloodworth
Mgr, ALCM Software
The Boeing Aerospace Company
MS-45-70
P.O. Box 3999
Seattle, WA 98124
(206) 655-6718

The Rome Air Development Center (RADC) has contracted with ITT Research Institute (IITRI) to establish and operate a software information analysis center. The center has been named the Data and Analysis Center for Software (DACS). One of the functions of DACS is to acquire and analyze data gathered during the various phases of the software development process with the purpose of identifying and quantifying those factors which contribute to the production of quality software. The data from this survey has been contributed to DACS and is available for analysis by any member of the AIAA Technical Committee on Computer Systems as well as the general computer community. Personnel interested in

receiving copies of this data, or requesting analysis of this data should
contact:

Ms Lorraine Duvalle
Data & Analysis Center for Software
RADC/ISI
Griffiss AFB, NY 13441
(315) 336-0937

ACKNOWLEDGEMENTS

In addition to the contributors listed in Appendix A, the author wishes to acknowledge the support and dedication of the following people:

From the Sacramento Air Logistics Center

Personnel who provided programming and analyst support are: Ms Bonnie J. Nieland, Mr Robert D. Heckler, Mr Grover "Bob" Collins, Mr John W. Robino, and Mr David E. Sturdevant.

The following individuals provided typing, proofreading, and composing support: Mrs Terry L. Meyer, Mrs Beryle E. McPheeters, Mrs Marianne L. Mueggenburg, and Mrs Betty J. Smith.

From the Boeing Aerospace Company

The Boeing Company's integrated logistic and systems maintenance team, consisting of Mr D. H. Wilson, Mr G. R. Herrold, and Mr W. B. Dalrymple, provided support in the areas of data reduction, data base structure, and file updating and verification. Dr Kenneth A. Hales, 1977 president of the AIAA Technical Committee on Computer Systems, provided the support of his committee in testing and completion of the questionnaires.

From the General Electric Company, Space Division

The Information Systems Program in Sunnyvale provided technical consultant support, proofreading, printing and encouragement through the services of Mr Gene F. Walters and his technical group.

From the Rome Air Development Center

RADC had offered to perform analysis of the data for the benefit of the U.S. Air Force, the AIAA Technical Committee on Computer Systems, and the computing community. Personnel responsible for this are: Mr Donald Roberts and Mr Alan R. Barnum. Ms Lorraine Duval, ITT Research Institute, who is general manager of the RADC Data and Analysis Center for Software (DACS), became the custodian of the data from this survey.

Special Acknowledgements from Sacramento, California

Mr Walter L. Antwiler from Sacramento, California spent many hours coding and recoding the survey answers for computer analysis. Mrs Mildred C. Thayer, Ms Lauren M. Thayer and Miss Meg L. Astleford proofread the typed copies and checked machine listings.

ATTACHMENT 1 TO SECTION 1

RELATIONSHIPS BETWEEN REPORTS

The survey was comprised of three parts, each dealing with a separate facet of software engineering project management. Part One dealt with the firm and the environment in which the project was done. Part Two was devoted to specific software engineering projects accomplished within the firm. Part Three asked the project managers their opinions about project management. Each of these parts can stand alone. Part One, reported in this volume, centers on the organization, management policies, staffing techniques and project controls of the companies that completed project questionnaires reported in Part Two.

Part Two, reported in Volume II of this report series, provided both detail and summary information on each project for which a valid questionnaire was returned. Each questionnaire could be considered a case study in project management. Part Three, reported in this Volume III of this report series, concerns ideas and perceptions about software engineering project management but does not relate to a given project or company.

At the same time, there is a relationship between these reports. Table 1 tells the relationships between Volumes I, II and III of this report.

TABLE 1 (ATTACHMENT 1 TO SECTION 1)
 RELATIONSHIPS OF PROJECTS REPORTED IN AIAA
 PROJECT MANAGEMENT SURVEY VOLUMES I, II AND III

| Survey Identification Nr (1) | VOL I (Part One) (2) | VOL II (Part Two) (3) | VOL III (Part Three) (4) |
|---------------------------------|-------------------------|--------------------------|-----------------------------|
| 101 | 30 | 101 | Yes |
| 102 | 30 | 102 | Yes |
| 103 | 30 | 103 | Yes |
| 104 | 31 | 104 | Yes |
| 105 | 33 (8) | 105 | Yes |
| 106 | 34 (8) | 106 | Yes |
| 107 | 35 | 107 | Yes |
| 108 | 35 | 108 | Yes |
| 109 | 35 | 109 | Yes |
| 110 | 36 | 110 | Yes |
| 111 | 36 | 111 | Yes |
| 112 | 39 (9) | 112 | Yes |
| 113 | 40 (9) | 113 | Yes |
| 114 | 41 | 114 | Yes |
| 115 | 69 | 115 | No |
| 116 | 42 | 116 | None |
| 117 | 43 | 117 | Yes |
| 118 | 45 | 118 | Yes |
| 119 | 45 | 119 | Yes |
| 120 | 51 | 120 | Yes |
| 121 | 66 (5) | 121 | Yes |
| 122 | 51 | 122 | Yes |
| 123 | 51 | 123 | Yes |
| 124 | 51 | 124 | Yes |
| 125 | 52 | 125 | Yes |
| 126 | 55 | 126 | Yes |
| 127 | None | 127 | Yes |
| 128 | 59 | 128 | No |
| 129 | None | 129 | Yes |
| 130 | 31 | 130 | Yes |

(TABLE 1 CONTINUED)

| Survey Identification Nr (1) | VOL I (Part One) (2) | VOL II (Part Two) (3) | VOL III (Part Three) (4) |
|---------------------------------|-------------------------|--------------------------|-----------------------------|
| 201 | 67 | 201 | None |
| 202 | 27 (7) | 202 | Yes |
| 203 | 28 (7) | 203 | Yes |
| 204 | 29 | 204 | Yes |
| 205 | 32 | 205 | Yes |
| 206 | 37 | 206 | Yes |
| 207 | 37 | 207 | Yes |
| 208 | 38 | 208 | Yes |
| 209 | 43 | 209 | Yes |
| 210 | 44 | 210 | Yes |
| 211 | 46 (10) | 211 | Yes |
| 212 | 47 (10) | 212 | Yes |
| 213 | 49 | 213 | Yes |
| 214 | 49 | 214 | Yes |
| 215 | 49 | 215 | Yes |
| 216 | 49 | 216 | Yes |
| 217 | 50 | 217 | Yes |
| 218 | 53 (11) | 218 | Yes |
| 219 | 54 (11) | 219 | Yes |
| 220 | 56 | 220 | Yes |
| 221 | 57 | 221 | Yes |
| 222 | 60 | 222 | Yes |
| 223 | 60 | 223 | Yes |
| 224 | 58 | 224 | Yes |
| 225 | 58 | 225 | Yes |
| 226 | 58 | 226 | Yes |
| 227 | 61 | 228 | Yes |
| 228 | 61 | 228 | Yes |
| 229 | 64 | 229 | Yes |
| 230 | 68 | 230 | Yes |
| 301 | 26 (6) | 301 | Yes |
| 302 | 48 (10) | None | None |
| 303 | 25 (5) | None | None |
| 304 | 68 | 304 (12) | None |
| 305 | 62 | None | None |
| 306 | 63 (7) | None | Yes |

FOOTNOTES FOR TABLE 1

(1) Column 1 - This column lists the returned surveys according to a randomly assigned identification number.

(2) Column 2 - The company identification number listed in column 2 is used in Vol I. In some cases, the same company was reported on by two or more individuals which resulted from two or more project managers reporting on different projects within the same company. In most instances these "double" reports were the same. Comments along these lines are contained in foot notes (5) through (12).

(3) Column 3 - This column lists the project numbers reported in Vol II. Projects with the same company numbers are from the same company or major subdivision.

(4) Column 4 - Vol III reports on data from Part Three. This column indicates whether or not the same person reported/wrote Part Two and Part Three of the survey. This is done so that the reader will know if there is any relationship between the project reported on in Part Two and the surveyee's opinions on the major problems of software development management.

(5) Company 25 and 66 are the same.

(6) Very small company. Part Three is reported as Part Three of Project 201.

(7) Company 27, 28 and 63 are the same. Answers reported under company 28 looked to be the most accurate and complete. Part Three of company 63 is reported as Part Three of Project 116.

(8) Company 33, 34 are the same. Answers reported under company 33 looked to be the most accurate and complete.

(9) Company 39 and 40 are the same and have identical answers.

(10) Company 46, 47 and 48 are the same. Answers reported under company 46 are considered to be the official answers by the surveyee.

(11) Company 53 and 54 are the same. Answers reported under company 54 looked to be the most accurate and complete.

(12) Project reported under project 304 was too large to be included.

SECTION 2

THE DATA

INTRODUCTION

This section reports on the actual data submitted by the participants on sixty aerospace projects. It is reported in tabulated, abbreviated and coded form and cannot be used completely without Appendix C. Every effort was made to disguise the contributor, including the deletion of some revealing data.

The questionnaire contained many different styles of questions: true or false, multi-choice answers, multi-part questions, fill-in-the-blanks, and narrative. Despite this multitude of styles, a common method of reducing and reporting the answers was developed (see Appendixes B and C). Multi-part questions were broken into separate questions through the use of part numbers (i.e., 01, 02, 03, etc.) and sub-part designators (a, b, c, d, etc.).

Each question is handled separately and reported as an array. The horizontal indices of the array refer to anonymous project identification numbers (see Section 1 for further explanation). The vertical indices refer to the question, part, and sub-part number. Every narrative answer has been coded or abbreviated by a three-character alphanumeric.

Generally speaking, the printing of a three-character alphanumeric opposite the sub-part of a question indicates that the participant answered "yes" or "true" as it applies to that part of the question. If a given question has a "blank" for an answer this indicates the surveyee answered "no" or "false" as pertains to that part of the question. With the exception of "none" or "missing" the alphanumeric is a code or abbreviation of a text answer that modifies the "yes" answer. The interpretation or meaning of the codes can be found in Appendix C. The author made every attempt to use codes that were easy to recognize (mnemonic).

In order for the reader to compare company environment to projects developed, the results are listed under the project identification number. This results in redundant reporting when a company reported on more than one project. Also, as reported in Section 1, sometimes more than one individual reported on the same company or firm. (The preferred report is reported on in Table 1 of Section 1). For those readers that want to compare results between companies, only the results reported on under the following projects should be used:

| | | | | |
|-----|-----|-----|-----|-----|
| 103 | 104 | 105 | 109 | 110 |
| 112 | 114 | 115 | 116 | 117 |
| 118 | 120 | 121 | 125 | 126 |
| 128 | 201 | 203 | 204 | 205 |
| 206 | 208 | 210 | 211 | 213 |
| 217 | 219 | 220 | 221 | 222 |
| 224 | 227 | 229 | 230 | |

Companies that reported on projects 127 and 129 did not fill out a Part One.

The questionnaire as printed in this report is a modified version of the questionnaire as originally answered (see Appendix B, Questionnaire, for explanation).

NAME POSITION DO YOU HOLD IN THE ARMY? (ORIGINAL NAME)

- A. SENIOR CORPORATE OFFICER (PRESIDENT, VICE PRESIDENT, EXECUTIVE OFFICER, ETC)
- B. SENIOR ADP OFFICER
- C. SENIOR FUNCTIONAL AREA (NON ADP) MANAGER (I.E., DIRECTOR OF ENGINEERING, MANAGER AIRFRAME DEVELOPMENT, CHIEF OF PRODUCTION PROGRAM MANAGER)
- D. PROJECT MANAGER SOFTWARE DEVELOPMENT
- E. TECHNICAL DIRECTOR, QUALITY ASSURANCE, DATA SUPERVISOR, ETC
- F. SENIOR CORPORATE STAFF
- G. PROJECT INDIVIDUAL
- H. NONE OF THE ABOVE
- I. OTHER/COMMENT IF NECESSARY

QUESTION NO

RESPONSE

| NAME/NO | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONSE

| NAME/NO | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

MIS MIS

UNIT 51100 202

WHAT IS THE TITLE/POSITION OF THE SENIOR ADP OFFICER IN THE
FIRM? (E.G., VICE PRESIDENT IN CHARGE OF DATA SERVICES
(USUALLY MANAGERIAL)
A. COMPANY OFFICER (PRESIDENT, VICE PRESIDENT, EXECUTIVE
OFFICER, ETC.)
B. CHIEF (VICE PRESIDENT, DIRECTOR, MANAGING HEAD) DATA
PROCESSING (COMPUTING, INFORMATION SYSTEMS, DATA SERVICES,
DATA AUTOMATION, ETC.)
C. ASSISTANT CONTROLLER (FINANCIAL MANAGER, ETC.)
D. SOFTWARE ANALYSTS (ENGINEER, DEVELOPER, ETC.)
E. NOT APPLICABLE TO ORGANIZATIONAL STRUCTURE
F. GIVE TITLE/COMMENT IF NECESSARY

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | CO2 | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WHAT IS THE TITLE/POSITION OF THE INDIVIDUAL TO WHOM THE SENIOR
ADP OFFICER REPORTS? (E.G. PRESIDENT, COMPTROLLER)
(ORIGINALLY NARRATIVE)
A. CORPORATE OFFICER (PRESIDENT, VICE PRESIDENT, EXECUTIVE
OFFICER, ETC.)
B. COMPTROLLER (VICE PRESIDENT FOR FINANCE, ETC.)
C. SENIOR FUNCTIONAL AREA (NON ADP) MANAGER (DIRECTOR/CHIEF
OF ENGINEERING, RESEARCH, OPERATIONS, ETC.)
D. FUNCTIONAL AREA SUPERVISORS
Y. NOT APPLICABLE TO ORGANIZATIONAL SIMULATIONS
Z. OTHER/COMMENT IF NECESSARY

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | LO2 | | LO2 | | | | | | | | | | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | |
| 01 B | | | LO2 | LO2 | | | | | | | | | | | | | | | | | | | | | | | | | | | LO2 |
| 01 C | | | | | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | | | | | | | | LO2 | LO2 | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | LO2 | | | | | |
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | MIS | | MIS | | |
| 01 Y | | | | | | | | | | | | | | | | | N/A | N/A | | | N/A | | | | | | | | | | |

N/A N/A N/A

MIS MIS

RESPONDOR

| PART/SUM | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | LO2 | | | LO2 | LO2 | | | LO2 | | | | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | LO2 | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LO2 |
| 01 C | | | | | | | | | | LO2 | | | | | | | | | LO2 | LO2 | | | | | LO2 | LO2 | LO2 | | | | LO2 |
| 01 D | | LO2 | | | | | | | | | LO2 | LO2 | LO2 | | | | | | LO2 | LO2 | | | | | LO2 | LO2 | LO2 | | | | LO2 |
| 01 Y | | | N/A | | | LO2 | LO2 | LO2 | N/A | | | | | | | | | | | | LO2 | | | | | | | | | | |

N/A

LO2

QUESTION 204

WHAT ARE THE TITLES/POSITIONS OF THE INDIVIDUALS REPORTING
DIRECTLY TO THE SENIOR ADP OFFICER? (E.G., CHIEF, SOFTWARE
DEVELOPMENT DIVISION)

A.-----
B.-----
C.-----
D.-----
E.-----
F.-----
Y. NAME/NOT APPLICABLE TO ORGANIZATION
Z. COMMENT IF NECESSARY

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | VPD | VPD | VPD | MAD | LUI | FUI | MSU | MSU | MSU | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD | MSD |
| 01 B | | | | MSA | LAP | FUP | MSA | MSA | MSA | MSD | MSD | | MSW | | | | | | | | | | | | | | | | | |
| 01 C | | | | MSA | LUP | FAP | MSA | MSA | MSA | MSA | | | MSD | | | | | | | | | | | | | | | | | |
| 01 D | | | | MSU | | FIM | | | | | | | MPL | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | FSE | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

18

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | VDR | LSW | | PMW | MEF | | | MIA | | MPA | MLP | MSD | MSD | MSD | MSH | FLS | FSW | MEF | USS | USS | FLS | FLS | FLS | MUS | MUS | | | | | MUS |
| 01 B | VPD | LSW | | PMK | MSD | | | MSL | | MUS | MEW | MSW | MSW | MSW | MSW | MSD | ENG | FLW | MLP | MP1 | MP1 | FLS | FLS | FLS | MEF | MEF | | | MEF | |
| 01 C | | | | | | | | MIM | | MSL | | MAI | MAI | MAI | MAI | MIM | FLW | ENG | MAU | MSW | MSW | | | MSK | MSK | | | | MSD | |
| 01 D | | | | | | | | | | | | MUS | MUS | MUS | MAI | | | MAA | MEF | MEF | | | | MLB | MLB | | | | MSD | |
| 01 E | | | | | | | | | | | | PMW | PMW | PMW | PMW | | | UP1 | MEF | MEF | | | | MMA | MMA | | | | MSD | |
| 01 F | | | | | | | | | | | | | | | | | | | MSD | MSD | | | | MAS | MAS | | | | MAU | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | MPU | MPU | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | N/A |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | VPD | LSW | | PMK | | | | | | | | | | | | | | | | | | | | | | | | | | |

N/A

MIS

MEF MEF FLS FLS FLS

PMW PMW PMW PMW

DPL

N/A

N/A

N/A

N/A

N/A

N/A

N/A

INITIAL IS A TYPICAL LINE OF AUTHORITY, FROM SENIOR ADP OFFICER
 SENIOR CORPORATE OFFICER OVER PROJECT) THROUGH SOFTWARE
 DEVELOPMENT PROJECT MANAGER (ADDED)

| | | |
|----|------------------------|----|
| A. | SENIOR ADP OFFICER (OR | TO |
| B. | ----- | TO |
| C. | ----- | TO |
| D. | ----- | TO |
| E. | ----- | TO |
| F. | ----- | TO |
| G. | ----- | TO |

(SOFTWARE DEVELOPMENT) PROJECT MANAGER
 NOT APPLICABLE TO ORGANIZATIONAL STRUCTURE
 COMMENT IF NECESSARY

[illegible]

REFERENCES

[illegible]

QUESTIONS 200

SOFTWARE DEVELOPMENT PROJECT MANAGERS ARE NORMALLY:
 A. FUNCTIONALLY ORIENTED (ACCOUNTANT) FOR ACCOUNTING APPLICATION,
 LOGISTICIAN FOR LOGISTICS APPLICATION, ENGINEERING, ETC. (ADDED)
 B. ADP MANAGEMENT ORIENTED
 C. SENIOR SOFTWARE ANALYSTS
 D. SENIOR SOFTWARE ANALYSTS/PROGRAMMERS
 E. PROFESSIONAL PROJECT MANAGERS (GENERALIST) (ADDED)
 F. NONE OF THE ABOVE (ADDED)
 G. OTHER (ADDED)

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| UI A | | | | | | | | | | | | | YES | YES | | | | | | | | | | | | | | | | |
| UI B | YES | YES | YES | | | | | | | | | YES | YES | YES | | | YES | | YES | YES | YES | YES | YES | | | | | | | |
| UI C | | | | | YES | YES | | | | | | | | | | | | | | | | | | | | | | | | |
| UI D | | | | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| UI X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

MIS MIS

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| UI A | | | YES | YES | YES | | | | | | | | YES | YES | YES | YES | | | | | | | | | | | | | | |
| UI B | YES | | | YES | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| UI C | | | | YES | YES | | | | | YES | | | | | | | | | | | | | | | | | | | | |
| UI D | | | | YES | | YES | YES | | | | | | | | | | | | | | | | | | | | | | | |
| UI E | | | | YES | | | | | | | | | | | | | | | | | | | | | | | | | | |

YES YES

THIS FIRM IS PRIMARILY: (TAKEN PART), FROM COMPUTER SOCIETY
SUBSCRIPTION FORM, 1 JUNE 1977)

- A. A MANUFACTURER OF COMPUTER HARDWARE
- B. A MANUFACTURER OF OTHER THAN COMPUTER HARDWARE
- C. A "SUPERMARKET HOUSE"
- D. AN ENGINEERING SERVICE AND TECHNICAL SUPPORT ORGANIZATION
- E. THE GOVERNMENT: FEDERAL (NON-MILITARY), FEDERAL (MILITARY), STATE, COUNTY, MUNICIPAL
- F. A UNIVERSITY OR EDUCATIONAL INSTITUTION
- G. A COMPUTER SERVICE BUREAU, TIME SHARING SERVICE
- H. AN ADP CONSULTANT AND/OR EDUCATION SERVICE
- I. FINANCIAL: BANKING, INSURANCE, REAL ESTATE, SECURITIES, CREDIT
- J. IN THE WHOLESALE OR RETAIL TRADE
- K. IN MEDICAL OR LEGAL SERVICES
- L. IN TRANSPORTATION SERVICES
- M. UTILITIES: COMMUNICATION, ELECTRIC, GAS
- N. OTHER: COMMENT:

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PARI/SIM | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

[illegible]

| PARI/SUM | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PARI/SUM | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |

[illegible]

OPERATING 200

THE FIRM IS:
 A. OPERATED FOR A PROFIT
 B. NON-PROFIT ORGANIZATION
 C. GOVERNMENT AGENCY
 D. NONE OF THE ABOVE (ADDED)
 E. OTHER:

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | | | YES | YES | | | YES | YES | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTION 209 THE FIRM HAS ----- PRINCIPAL LOCATIONS. (E.G., FACTORY IN FLORIDA,
MINE AND SMELTER IN ASHLAND, HOME OFFICE IN NEWARK: = 3 LOCATIONS)

BTSPDNDUP

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130
01 001 006 006 001 001 001 001 001 001 001 003 003 002 002 001 003 004 004 001 020 001 001 002 001 001 004 004 001

BTSPDNDUP

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230
01 001 012 015 001 005 014 001 001 003 003 010 011 001 006 006 006 006 012 015 002 004 002 011 011 001 001 001 003 003 008 012

QUESTION 210 SOFTWARE SYSTEM DEVELOPMENT IS CARRIED ON AT ----- OF THESE
LOCATIONS.

RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130
01 001 006 006 001 001 001 001 001 001 001 MIS 002 002 001 002 002 002 001 002 002 001 020 001 001 001 001 MIS 003 MIS 001

RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230
01 001 006 MIS 001 005 006 001 001 002 002 009 010 001 002 002 002 002 012 MIS 001 004 002 003 003 001 001 001 003 003 004 007

GROSS REVENUES (BUDGET FOR GOVT AGENCIES) FOR 1991
YEAR REPORTED (197--) WERE: (ADDED)

YEAR REPORT

A. LESS THAN 200 THOUSAND DOLLARS

B. BETWEEN 200 THOUSAND AND 1 MILLION DOLLARS

C. BETWEEN 1 MILLION AND 10 MILLION DOLLARS

D. BETWEEN 10 MILLION AND 50 MILLION DOLLARS

E. BETWEEN 50 MILLION AND 100 MILLION DOLLARS

F. BETWEEN 100 MILLION AND 500 MILLION DOLLARS

G. BETWEEN 500 MILLION AND 1 BILLION DOLLARS

H. IN EXCESS OF ONE BILLION DOLLARS

OTHER: _____

| | PLSPONDUP | |
|----------|---|-----|
| PART/SUM | 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 | 077 |

[illegible][illegible]

QUESTION 212

WHAT PERCENT OF (TOTAL) REVENUE IS DERIVED FROM SOFTWARE DEVELOPMENT? (FOR SOFTWARE DEVELOPED FOR PROFIT) (ADDED)

A. LESS THAN 10%
 B. BETWEEN 10% AND 25%
 C. BETWEEN 25% AND 50%
 D. BETWEEN 50% AND 75%
 E. OVER 75%
 F. ALL REVENUE DERIVED FROM SOFTWARE DEVELOPMENT
 G. (NOT APPLICABLE) (ALL DEVELOPMENT DONE FOR IN-HOUSE CUSTOMERS)
 H. OTHER:

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WHAT PERCENT OF THE (TOTAL PROFITS, ANNUAL BUDGET IS DEVOTED TO SOFTWARE DEVELOPMENT ACTIVITIES? (FOR SOFTWARE NOT DEVELOPED FOR PROFIT/GOVERNMENT AGENCIES) (ADDED)

- A. LESS THAN 10%
- B. BETWEEN 10 AND 25%
- C. BETWEEN 25 AND 50%
- D. BETWEEN 50 AND 75%
- E. OVER 75%
- F. NOT APPLICABLE (ADDED)
- G. COMMENT:

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | YES | | | | YES | YES | YES | YES | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | | | | | YES | | | | YES | YES | | | | | | | | YES | | | | | | | | | | YES |
| 01 C | | | | | | | YES | | | | | | | | | | | | | | | | | | | | | | | YES |
| 01 D | YES | YES | YES | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | YES | | | YES | YES | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | YES | YES | | | | | | | | YES | | | | | | | | | | | | | | | | | | YES |
| 01 C | | | | | YES | | | | | | | | | | | | | | | | | | | | | | | | | YES |
| 01 D | YES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WHO EXERCISES APPROVAL AUTHORITY IN MAJOR SOFTWARE DEVELOPED FOR IN-HOUSE USE?

- A. CORPORATE OFFICER (PRESIDENT, VICE PRESIDENT, ETC) (ADDED)
- B. SENIOR FUNCTIONAL AREA MANAGER (ADDED)
- C. COMPTROLLER
- D. DIRECTOR OF DATA PROCESSING (SENIOR ADP OFFICIAL) (ADDED)
- E. EXECUTIVE ONE STEP ABOVE FUNCTIONAL AREA INVOLVED
- F. SELECTION COMMITTEE (ADDED)
- G. PROJECT MANAGER (ADDED)
- H. EXECUTIVE REQUESTING SYSTEM THROUGH SOME FORM OF INTERNAL BUDGET SCHEME (REQUIREMENT DOCUMENT) (ADDED)
- I. SOFTWARE NOT DEVELOPED FOR IN-HOUSE USE (ADDED)
- J. OTHER:

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | YES | YES | YES | | | | | | | | | | | | | | | | | | YES | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 O | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

IN THIS QUESTION WE WISH TO ASCERTAIN WHICH FORMS OF CONTRACT YOU EMPLOY AND WHICH YOU PREFER IN EACH OF THESE SITUATIONS. IN RESPONDING YOU MAY EITHER CHECK THE ANSWER OR PROVIDE A RANK ORDERING OF THOSE ANSWERS THAT APPLY. THE FIRST SITUATION RELATES TO YOUR HIRING THE CONTRACTOR PROVIDING SOFTWARE DEVELOPMENT FOR A USER OR CUSTOMER. THE SECOND SITUATION REVERSES THIS AND PLACES YOU IN THE USER OR CUSTOMER ROLE. THE FINAL SITUATION CONCERNS THE FORM OF AGREEMENT THAT IS EMPLOYED WITH SOFTWARE DEVELOPERS OF THE FIRM'S OWN STAFF. (ASAP, 1972)

| CONTRACTOR | YOU ARE | YOU CONTRACT | FOR | IN-HOUSE USE | DEVELOP FOR |
|------------|------------|--------------|------------|--------------|-------------|
| USF PHEFFR | USF PHEFFR | USF PHEFFR | USF PHEFFR | USF PHEFFR | USF PHEFFR |
| (1) | (2) | (3) | (4) | (5) | (6) |

CONTRACT TYPE
A. FIRM FIXED PRICE
H. FIXED PRICE WITH ECONOMIC
PRICE ADJUSTMENT
C. FIXED PRICE INCENTIVE
D. FIRM FIXED PRICE LEVEL
OF EFFORT
F. COST
F. COST SHARING
G. COST PLUS INCENTIVE FEE
H. COST PLUS AWARD FEE
I. COST PLUS FIXED FEE
J. TIME AND MATERIALS
K. LARUB-HOHR
L. BASIC ORDERING AGREEMENT
Y. NONE (ADDEND)
Z. OTHER:

RESULTS

[illegible]

| PART/SIM | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | | | | | | | | | | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

00 SP000000

| DATE/ID | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 00 A | | | | | YES | YES | NO | NO | NO | NO | | | | | | | | | | YES | | | YES | | YES | | YES | | YES | | YES | |
| 00 B | | | | | | | | | | NO | NO | | | | | | | | | | | | | | | | | | | | | |
| 00 C | | | | | | | | | NO | NO | NO | NO | | | | | | | | | | | | | | | | | | | | |
| 00 D | | | | | | | | | | | | | NO | NO | | | | | | YES | | YES | YES | | | | | | | | | |
| 00 E | | | | | | | | | | | | | | | | | | | | YES | | YES | YES | | YES | | | | | | | |
| 00 F | | | | | | | | | NO | NO | NO | NO | | | | | | | | | | | | | | | | | | | | |
| 00 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

00 SP000000

| DATE/ID | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | | | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| 00 A | | | | | YES | | | YES | | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | | |
| 00 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 C | | | | | YES | YES | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 0000000000 | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 00000000 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 |
| 00000000 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 |
| 00000000 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
| 00000000 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 |
| 00000000 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 |
| 00000000 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 |
| 00000000 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 |
| 00000000 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 |
| 00000000 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 |
| 00000000 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 |
| 00000000 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 |
| 00000000 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 |
| 00000000 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 |
| 00000000 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 |
| 00000000 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 |
| 00000000 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 |
| 00000000 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 |
| 00000000 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 |
| 00000000 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 |
| 00000000 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 |
| 00000000 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 |
| 00000000 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 |
| 00000000 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 |
| 00000000 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 |
| 00000000 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 |
| 00000000 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 |
| 00000000 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 |
| 00000000 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 |
| 00000000 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 |
| 00000000 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 |
| 00000000 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 |
| 00000000 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 |
| 00000000 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 |
| 00000000 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 |
| 00000000 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 |
| 00000000 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 |
| 00000000 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 |
| 00000000 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 |
| 00000000 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 |
| 00000000 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 |
| 00000000 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 |
| 00000000 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 |
| 00000000 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 |
| 00000000 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 |
| 00000000 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 |
| 00000000 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 |
| 00000000 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 |
| 00000000 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 |
| 00000000 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 |
| 00000000 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 |
| 00000000 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 |
| 00000000 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 |
| 00000000 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 |
| 00000000 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 |
| 00000000 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 |
| 00000000 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 |
| 00000000 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 |
| 00000000 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 |
| 00000000 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 |
| 00000000 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 |
| 00000000 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 |
| 00000000 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 |
| 00000000 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 |
| 00000000 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 |
| 00000000 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 |
| 00000000 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 |
| 00000000 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 |
| 00000000 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 |
| 00000000 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 |
| 00000000 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 |
| 00000000 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 |
| 00000000 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 |
| 00000000 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 |
| 00000000 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 |
| 00000000 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 |
| 00000000 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 |
| 00000000 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 |
| 00000000 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 |
| 00000000 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 |
| 00000000 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 |
| 00000000 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 |
| 00000000 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 |
| 00000000 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 |
| 00000000 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 |
| 00000000 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 |
| 00000000 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 |
| 00000000 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 |
| 00000000 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 |
| 00000000 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 |
| 00000000 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 |
| 00000000 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 |
| 00000000 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 |
| 00000000 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 |
| 00000000 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 |
| 00000000 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 |
| 00000000 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 |
| 00000000 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 |
| 00000000 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 |
| 00000000 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 |
| 00000000 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 |

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| 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 | 1481 | 1482 | 1483 | 1484 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--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of Spreads

| PART/300 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

of Spreads

| PART/300 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

NUM

PT SPENDING

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 03 A | | | | YES | | | | | | | | | | | | | | | | | | | | | | | | | YES | YES |
| 03 B | | | | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 03 C | | | | | | YES | YES | | | | | 002 | 002 | | YES | | | | | | | | | | | | | | | |
| 03 A | | | | MIS | MIS | MIS | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

DI SPENDING

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 03 A | | | | | | | YES | YES | YES | YES | YES | | | | | | | | | | | | | | | | | | | |
| 03 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 X | | | | MIS | MIS | MIS | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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IF AN INCENTIVE CLAUSE IS INCLUDED IN THE CONTRACT, WHAT IS THE INCENTIVE NORMALLY BASED ON?

YOU ARE YOU CONTRACT DEVELOP FOR
CONTRACTOR FOR IN-HOUSE USE
(1) (2) (3)

- A. REDUCED COST
B. EARLY DELIVERY
C. INCREASED PERFORMANCE
D. QUALITY FACTORS
E. NOT USED (ADDED)
F. OTHER

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | YES | YES | YES | | | YES | | | | | | YES | YES | | | YES | | | | YES | YES | YES | YES | YES | | | | | | | |
| 01 H | YES | YES | YES | | | | | | | YES | YES | | | YES | | | | | | YES | YES | YES | YES | YES | | | | YES | | | |
| 01 L | | | | | | | | | | | | | | | | | YES | | | YES | | YES | YES | YES | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | YES | | YES | YES | YES | S | | | | | | |
| 01 X | | | | | | | | | | | | | | | MIS | | | | | | | | | | | MIS | | MIS | | | |
| 01 Y | | | | COT | COT | | COT | COT | COT | | | | | | | COT | | COT | COT | | | | | COT | COT | | | | | COT | |

[illegible]

RESPONDING

| PART/SUM | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | | | | | | YES | | | | | YES | YES | YES | | | | | | | YES | YES | YES | YES | YES | | | | | YES | |
| 02 B | | | | | | | | | | | | | | | | | | | | YES | YES | YES | YES | YES | | | | | | |
| 02 C | | | | | | | | | | | | | | YES | | | | | | YES | YES | YES | YES | | | | | | | |
| 02 D | | | | | | | | | | YES | YES | | | | | | | | YES | YES | YES | YES | YES | | | | | | | |
| 02 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDING

| PART/SUM | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | | YES | YES | | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 02 B | | | | YES | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 02 C | | | | | | | | | | | YES | | | | | | | | | | | YES | YES | | | | | | | |
| 02 D | | | | | | | | | | | | | | | | | | | | | | YES | YES | | | | | | | |
| 02 E | | | | | | | | | | | | | | | | | | | | | | YES | YES | | | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDUP

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 03 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 U | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDUP

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 03 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTIONS 219

ARE BONUS OR INCENTIVES PAID FOR EARLY/ON TIME COMPLETION OF
SOFTWARE DEVELOPMENT PROJECTS?

- A. YES, FOR KEY PERSONNEL
- B. YES, FOR OTHER THAN MANAGEMENT POSITIONS
- C. YES, FOR ALL INDIVIDUALS ENGAGED FULL TIME ON THE PROJECT
- D. YES, TO PROJECT MGR ON FIXED PRICE CONTRACTS (ADDED)
- E. YES, BASED ON INDIVIDUAL PERFORMANCE (ADDED)
- F. YES, MANAGEMENT INCENTIVE PROGRAM (ADDED)
- G. YES, HIGHLY AWARD FEE ON CONTRACT (ADDED)
- H. NO BONUS OR INCENTIVES WERE PAID (ADDED)
- I. OTHER:

RESPONDENT

| PART/5th | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | | | | | | | | | | | | | | | YES | YES | YES | YES | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

YES

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NUN NUN NUN

RESPONDENT

| PART/5th | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | | | | YES | | | | | | YES | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

YES YES

YES

CO2

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HAVE PROCEDURES BEEN EMPLOYED IN WHICH PROGRAMMERS OR ANALYSTS
 DID ON SPECIFIC TASKS IN THE DEVELOPMENT OF PROJECTS? E.G.,
 "I'll write the FORTRAN FOR \$1,217.12."

A. YES
 B. NO
 7. COMMENT:

RESPONDER

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDER

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | YES | | | YES | | | | | | | | | | | YES | | | | | | | | | | | | |
| 01 B | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

IN MOST INSTANCES:

IN MOST INSTANCES:

A. SUPERIOR DEVELOPMENT PROJECTS ARE HANDLED WITHIN THE ADP ENVIRONMENT WITH FUNCTIONAL ANALYSTS OR PROSPECTIVE USERS BEING ASSIGNED OR ATTACHED TO THE DEVELOPMENT TEAM.

B. AD SPECIALISTS ARE DETACHED OR ASSIGNED TO THE FUNCTIONAL USER FOR THE DURATION OF THE DEVELOPMENT EFFORT.

C. NONE OF THE ABOVE (ADD)

D. OTHER.

[illegible][illegible]

TRANS ARE TYPICALLY MADE UP OF:

A. PERMANENT EMPLOYEES -----X

B. TEMPORARY HIRES EMPLOYED FOR DURATION OF PROJECT -----X

C. CONSULTANTS HIRED AT DAILY/WEEKLY/MONTHLY RATE -----X

7. 040000;

| PI SPENDING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
| 01 A | 100 | 100 | 100 | 100 | 090 | 080 | 100 | 100 | 100 | 085 | 100 | 100 | 100 | 075 | 100 | 100 | 097 | 100 | 100 | 100 | 095 | 100 | 100 | 100 | 100 | 100 | 090 | 100 | 100 | 100 | |
| 01 B | | | | | | | | | | | | | | | 025 | | 003 | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | 005 | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| OF SPENDING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
| 01 A | 100 | 100 | 100 | 100 | 100 | | | 098 | 097 | 090 | 100 | 080 | 100 | 100 | 100 | 100 | 099 | 100 | 090 | 098 | 100 | 090 | 090 | 070 | 070 | 070 | 095 | 095 | 098 | 100 | |
| 01 B | | | | | | | | | | 003 | 003 | 010 | | | | | | | | 002 | | | | 030 | 030 | 030 | 005 | 005 | | | |
| 01 C | | | | | | | 002 | | | 007 | 010 | 010 | | | | | 001 | 010 | 010 | 010 | 010 | | | | | | | | | 002 | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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IF POSSIBLE, OUTLINE THE COMPOSITION OF A TYPICAL LARGE DEVELOPMENT TEAM AS IT WOULD BE EMPLOYED IN YOUR FIRM. TO PLACE THE TEAM IN CONTEXT A HYPOTHETICAL PROJECT DESCRIPTION MAY BE INCLUDED (E.G., DEVELOPMENT OF AN ON-LINE AIR CARGO MANIFESTING CAPABILITY.)

HYPOTHETICAL PROJECT DESCRIPTION (OPTIONAL):-----
 FRACCTIONS MAY BE USED TO INDICATE THAT THE POSITION IS NOT CONSIDERED A FULL TIME JOB. THE FOLLOWING IS AN EXAMPLE OF THE NOTATION TO BE USED IF ONE INDIVIDUAL OCCUPIES MORE THAN ONE POSITION.

F. ADMINISTRATOR-----1/3 (G)

G. LIBRARIAN - DESIGN ASSISTANT-----2/3 (F)

THE LETTER IN PARENTHESES IS INTENDED TO BE THE SAME INDIVIDUAL IN POSITIONS F AND G.

POSITION TITLE TITLE USED BY FIRM(1) NUMBER(2)

A. PROJECT MANAGER

B. ASST. PROJ. MGR.

C. SENIOR ANALYST

D. TEAM CHIEF

E. ASST. TEAM CHIEF

F. ADMINISTRATOR

G. LIBRARIAN

H. APPLICATION ANAL.

I. FUNCTIONAL ANAL.

J. APPLICATIONS PROG.

K. OPER. SYS. PROG.

L. TESTER

M. INTEGRATOR

N. DATA BASE DESIGNER (ADDED)

O. DATA BASE ADMINISTRATOR (ADDED)

P. TRANSITION TO PRODUCTION INTERFACE (ADDED)

Q. QUALITY ASSURANCE (ADDED)

R. STAFF ASSIGNMENT TO ASST. PROJ. MGR. (ADDED)

S. DOCUMENTATION AIDS (ADDED)

T. HARDWARE ENGINEERS (ADDED)

U. NONE OF THE ABOVE (ADDED)

7. OTHER

[illegible]

DEFINITION 225

WHAT IS THE NORMAL/TYPICAL PROGRESSION TO THE POSITION OF PROJECT MANAGER. E.G., PROGRAMMER, ANALYST, LEAD PROGRAMMER, PROJECT MANAGER? (INDICATE BY PUTTING NUMBER OPPOSITE POSITION USED IN ORDER OF PROGRESSION STARTING WITH "1" ON LOWEST POSITION AND ENDING WITH PROJECT MANAGER)) (ADDED) (ORIGINALLY NARRATIVE)

A. ASSOCIATE PROGRAMMER
 B. JUNIOR PROGRAMMER/ANALYST
 C. JUNIOR ANALYST
 D. WORK UNIT LEADER
 E. ASSISTANT ENGINEER
 F. SOFTWARE ENGINEER
 G. ASSOCIATE ENGINEER
 H. PROGRAMMER
 I. ASSOCIATE PROGRAMMER/ANALYST
 J. SENIOR PROGRAMMER
 K. SYSTEMS ANALYST
 L. PROGRAMMER/ANALYST
 M. LEAD ANALYST
 N. LEAD ENGINEER
 O. CHIEF AVIONICS ENGINEER
 P. LEAD PROGRAMMER
 Q. STAFF PROGRAMMER/ANALYST
 R. HEAD PROGRAMMER
 S. SENIOR PROGRAMMER/ANALYST
 T. TASK/WORK PACKAGE MANAGER
 U. ENGINEER
 V. TEAM CHIEF
 W. SENIOR SYSTEMS ANALYST
 AA. DATA SYSTEMS SPECIALIST
 BB. SUPERVISOR
 CC. DEPARTMENT HEAD
 DD. CHIEF ENGINEER
 EE. SENIOR ENGINEER
 FF. SOFTWARE SYSTEMS ENGINEER
 GG. SOFTWARE DEVELOPMENT MANAGER
 HH. DEPUTY/ASSOCIATE PROJECT MANAGER
 II. SCIENTIFIC PROGRAMMING SPECIALIST
 JJ. GROUP LEADER/SOFTWARE DEVELOPMENT
 KK. ADVISORY ANALYST
 LL. PROJECT LEADER
 MM. PROJECT ENGINEER
 NN. FIRST LINE SUPERVISOR
 OO. SECOND LINE MANAGER
 PP. ENGINEERING MANAGER
 QQ. PROJECT MANAGER
 Y. NO PATTERN
 Z. OTHER

PL SPONDUP

| PARI/SUN | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 HH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 G | | | | | | | | | | 001 | 001 | | | | | | | | | | | | | | | | | | | | |
| 01 H | 001 | 001 | 001 | 001 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 HH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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QUESTION 226

ARE APPLICATIONS ANALYSIS ALSO LOGICIAN PROGRAMMERS?

- A. ALWAYS
- B. MORE THAN HALF OF OUR ANALYSTS ARE ALSO PROGRAMMERS
- C. LESS THAN HALF OF OUR ANALYSTS ARE ALSO PROGRAMMERS
- D. VERY HARDLY IS AN ANALYST ALSO A PROGRAMMER
- E. VARIES DEPENDING ON TYPE OF WORK (ADDED)
- F. COMMENT?

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 O | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Q | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 S | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 T | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 U | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 M | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 O | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Q | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 S | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 T | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 U | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTION 221

WHAT IS YOUR APPROXIMATE RATIO BETWEEN STRAIGHT PROGRAMMERS AND ANALYSIS (PROGRAMMER/ANALYST)? (FILL IN NUMBER OPPOSITE A OR B TITLE TO INDICATE RATIO) (ADDED) (ORIGINALLY NARRATIVE)
 A. PROGRAMMERS
 B. ANALYSTS/ANALYST PROGRAMMERS
 C. VARIES, DEPENDING ON SITUATION
 D. NONE/VERY FEW STRAIGHT PROGRAMMERS OR ANALYSTS (ADDED)
 E. SUMMENT

RESPONDENT

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| 01 A | | | | 000 | 002 | 003 | 001 | 001 | 001 | 001 | 001 | 1.5 | 002 | 001 | | | 001 | 001 | 000 | 010 | 000 | 000 | 000 | 000 | 001 | | 001 | | 000 | | | |
| 01 B | | | | 001 | 001 | 001 | 003 | 003 | 001 | 001 | 001 | 001 | 001 | 001 | 010 | | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 010 | | 013 | | 001 | | | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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VAR

RESPONDENT

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| 01 A | | 000 | | 1.5 | 003 | | | 001 | | 004 | 001 | 002 | 001 | 001 | 001 | 001 | | 000 | 002 | 000 | 000 | 003 | 003 | 001 | 001 | 001 | 001 | 001 | 004 | 000 | | |
| 01 B | | 001 | | 001 | 001 | | 2.3 | | 001 | 004 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 001 | 002 | 002 | 002 | 1.5 | 1.5 | 001 | 001 | | |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

VAR

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WHICH MANUAL REPORTING PROCEDURES ARE USED IN PROJECT MONITORING
AND MANAGEMENT? AT WHAT LEVEL DO THEY ORIGINATE, AND HOW HIGH DO
THEY GO? HOW OFTEN ARE THEY AGGREGATED, CONDENSED, OR EDITED AS
THEY MOVE THROUGH THE CHAIN?

LOWEST(1) HIGHEST(2) NO. OF(3)
ORIGINATOR RECIPIENT AGGREGATES

REPORT TITLE
A. AGENCY ACTIVITY
B. PROJ. STATUS
C. SIGNIFICANT CHG
D.-----
E.-----
F.-----
G. NO MANUAL REPORTING SYSTEM USED.
7. COMMENTS

DESPONDUP

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | FLS | FLS | FLS | CPR | ENG | CPA | CPA | CPA | CPA | CPR | CPR | FSW | ENG | WDR | ISF | CPA | FLS | CPA | CPA | CPA | CPA | WDR | FLS | WDR | FLS | WDR | FLS | WDR | FLS | WDR | FLS |
| 01 B | PMR | PMR | PMR | LPA | CPR | ISP | CPA | CPA | CPA | PEN | FSW | ENG | OLU | MSD | MSD | CPA | FLS | CPA | CPA | CPA | CPA | YES | WDR | PMR | LPA | PMR | PMR | PMR | PMR | PMR | |
| 01 C | CPR | ISP | CPA | CPA | CPA | CPA | CPA | CPA | CPA | CPA | MSD | ENG | MSD | MSD | MSD | CPA | FLS | CPA | CPA | CPA | CPA | WDR | PMR | PMR | PMR | PMR | PMR | PMR | PMR | PMR | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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DESPONDUP

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | CPR | | | | CPR | WDR | WDR | FSF | ISF | PMR | | | | | | | | | | | | | | | | | | | | |
| 01 B | PMR | | | | CPR | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS |
| 01 C | CPR | | | | CPR | | | | | MSD | LPA | PMR | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS | FLS |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

NUN

PMR PMR

PAM

DESPONDUP

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | PMR | PMR | PMR | | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR |
| 02 B | VPC | VPC | VPC | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR |
| 02 C | | | | | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR | WDR |
| 02 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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RESPONDUR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | PMR | | | | PMR | PMR | PMR | MCP | PMR | | MCP | | | | | VPG | MLN | VPG | MCP | PMR | PMR | PMR | | | | | | | MLN | MLN | MLP |
| 02 B | VPG | | | | PMR | MLP | MLP | | PMR | | MLP | | MLN | MLN | MLN | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG |
| 02 C | | | | | PMR | MLN | MLP | | PMR | | MLP | | MLN | MLN | MLN | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG | VPG |
| 02 X | | | | | MIS | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDUR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 03 A | 001 | 001 | 001 | 003 | 003 | 003 | 002 | 002 | 002 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | |
| 03 B | 002 | 002 | 002 | 000 | 003 | 003 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | |
| 03 C | | | | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 | 002 |
| 03 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDUR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 03 A | 002 | | | | | 000 | 000 | 002 | 004 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | |
| 03 B | 005 | | | | | 002 | 002 | 002 | 002 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | |
| 03 C | | | | | | 002 | 002 | 002 | 002 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | 000 | |
| 03 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

WITH AUTOMATED REPORTING SYSTEMS AND USED IN PROJECT MONITORING AND MANAGEMENT?

10151(1) 10151(2)
ORIGINATOR RECIPIENT

A. MANHOUR BY ACTIVITY (E.G., CODE, FLOW DIAGRAM, ETC.)
H. MAN DAY BY TASK (E.G., PREPARE USERS GUIDE, DESIGN DATA BSE ETC.)
C.-----
D.-----
Y. NO AUTOMATED REPORTING SYSTEMS USED.
7. COMMENTS.

RESPONDOR

| PCSPNDQR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
| 01 A | | | | | | 1PA | CPA | CPA | CPA | CPA | SLI | FSW | FUG | | | MUR | VAR | | YES | YES | | | | | | | | | | | |
| 01 H | | | | | | | | CPA | CPA | CPA | CPR | CPR | ISP | FUG | | | VAR | | | | CPA | | CPA | CPA | CPA | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| REPT: 000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPOND

| PART/SH | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | CSC | CSC | CSC | | | | INH | INH | INH | INH | INH | PRO | PRO | | INH | VAR | VAR | VAR | INH | INH | INH | TRM | TRM | TRM | TRM | CSC | INH | | | |
| 02 B | CSC | CSC | CSC | | | | INH | INH | INH | INH | INH | | | | CSC | | | | CIG | | CIG | CIG | CIG | | FED | | | | | |
| 02 C | CSC | CSC | CSC | | | | INH | INH | INH | | | | | | III | | | | TRM | | TRM | TRM | TRM | | INH | | | | | |
| 02 D | | | | | | | FST | FST | FST | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 E | | | | | | | INH | INH | INH | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 H | | | | | | | | | | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 X | | | | | | | | | | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |
| 02 Y | | | | | | | | | | | | | | | | | | | TRM | | TRM | TRM | TRM | | TRM | | | | | |

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RESPOND

| PART/SH | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 02 A | TRM | | | INH | | | | INH | VAR | | TRM | TRM | TRM | TRM | TRM | TRM | TRM | | INH | TRM | HAC | HAC | INH | INH | INH | INH | TRM | TRM | TRM | INH |
| 02 B | TRM | | | | | | | | | | TRM | TRM | TRM | TRM | TRM | TRM | TRM | | TRM | TRM | UNI | UNI | INH | INH | INH | INH | ADP | | | |
| 02 C | | | | | | | | | | | TRM | TRM | TRM | TRM | TRM | TRM | TRM | | TRM | TRM | INH | INH | INH | INH | INH | TRM | TRM | | | |
| 02 D | | | | | | | | | | | MRT | | | | | | | | | | | | | | | | | | | |
| 02 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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IF YOU PURCHASE SUPPLIES, AIDS/PACKAGES FROM EXTERNAL DEVELOPERS
APPROXIMATELY WHAT PERCENT IS PURCHASED (VALUES DEVELOPED
IN-HOUSE)? ----- 2

PI SPONDUP

PAR1/SUM 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130
01 001 MIS MIS MIS 000 MIS 015 020 020 020 010 010 030 030 010 005 MIS MIS 010 010 002 000 002 002 002 090 030 MIS 070 MIS 000

PI SPONDUP

PAR1/SUM 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230
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DISPOSITION

ARE SUBTITLES PRESENTLY PRESENT IN ASSEMBLY LANGUAGE AS
APPROPRIATE TO A HIGHER ORDER LANGUAGE SUCH AS COUNCIL?

- A. YES
B. NO (WHAT LANGUAGE)
C. VARIOUS WIDELY (ADDED)
D. NONE USED (ADDED)
E. COMMENT:

RESPONSE

| PL SPONDUR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
| 01 A | | | | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | | | YES | YES | | | | | | | | | | YES | | |
| 01 B | | | | | | | | | | YES | YES | | | | YES | | | | | | | | | | | | | | | | |
| 01 C1 | | | | FOR | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 C2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Z | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

YES

YES YES

YES

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| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
| 01 A | YLS | | YLS | YLS | | | | | | | YLS | | YLS | YLS | YLS | | | | | | | YLS | YLS | YLS | YLS | YLS | YLS | | | |
| 01 B1 | | | FOR | | FOR | FOR | FOR | FOR | FOR | FOR | | | | | | | FOR | FOR | FOR | | | | | | | | | | | |
| 01 B2 | | | | | | PL1 | PL1 | | | JOV | | | | | | | PL1 | | | | | | | | | | | | | |
| 01 X | | | MIS | | | | | | MIS | | MIS | | | | | | | | | MIS | MIS | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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YES YES YES YES YES YES YES YES

YES YES YES YES YES YES YES YES

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00051100 250 WHICH SOFTWARE DEVELOPMENT AIDS COPY LIBRARY) SUPPLIED BY
THE HARDWARE MANUFACTURER DO YOU USE TO ASSIST IN APPLICATION
SYSTEM DEVELOPMENT?

NAME (1) MANUFACTURER(2)
A. -----
B. -----
C. -----
D. -----
E. -----
F. -----
Y. DON'T USE ANY OF THEM

PT SPINDUR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 U | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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PT SPINDUR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
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| 01 P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Q | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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QUESTION 251

IF YOU ARE PRESENTLY USING ON-LINE, INTERACTIVE PROGRAMMING,

CHECK AND FILL IN THOSE ANSWERS WHICH APPLY.

A. WE ARE PRESENTLY STARTING TO USE ON-LINE INTERACTIVE PROGRAMMING

B. WE HAVE BEEN USING ON-LINE, INTERACTIVE PROGRAMMING SINCE 19---

C. WE PRESENTLY EMPLOY ON-LINE, INTERACTIVE PROGRAMMING ON

-----2 OF THE PROJECTS FOR WHICH HARDWARE AND SOFTWARE

SUPPORT FOR THE CAPABILITY ARE AVAILABLE

Y. DO NOT USE ON-LINE, INTERACTIVE PROGRAMMING

7. COMMENT:

PT SPNDUR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
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| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

PT SPNDUR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
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| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTION 238

OUR EXPERIENCE TO DATE INDICATES THAT ON-LINE, INTERACTIVE

PROGRAMMING IS:

A. A HIGHLY EFFECTIVE DEVELOPMENT TOOL

B. EFFECTIVE IN SOME CASES

C. OF LIMITED UTILITY

D. A DRAIN ON HUMAN RESOURCES

E. INEFFICIENT USE OF PERSONNEL (EXPENSIVE) (ADDED)

F. A NICE TOY

G. NO EXPERIENCE WITH ON-LINE, INTERACTIVE PROGRAMMING

H. OTHER:

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 B | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTION 239

IF YOUR EXPERIENCE REFLECTS THAT ON-LINE, INTERACTIVE PROGRAMMING IS AN EFFECTIVE TOOL, IN WHICH SITUATION IS IT MOST EFFECTIVE?

- (CHECK OR RANK ORDER)
 A. DURING DEVELOPMENT OF CODE
 B. TO TRY SHORT LENGTH OF CODE FOR POSSIBLE USE (SIMULATION APPROACH)
 C. DURING DEBUGGING
 D. DURING TESTING
 E. DURING ROUTINE RUNS (ADDED)
 F. TO DO QUICK AND DIRECT JOBS (ADDED)
 G. SCIENTIFIC ANALYSIS (ADDED)
 H. AS A SUPPORT TOOL TO UPDATE DATA (ADDED)
 I. NOT AN EFFECTIVE TOOL
 J. DO NOT USE ON-LINE, INTERACTIVE PROGRAMMING
 7. OTHERS

RESPONDOR

| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | 004 | 004 | 004 | YES | YES | 001 | 001 | | | | | YES | YES | | | | | | YES | | | | | |
| 01 H | | | | YES | | | 002 | 002 | 002 | YES | YES | 002 | 002 | | | | | | | | | | | | | | | | | YES |
| 01 L | | | | YES | | | 001 | 001 | 001 | YES | YES | 002 | 002 | | YES | | | | YES | YES | YES | YES | YES | | YES | | | | | YES |
| 01 U | | | | YES | | | 003 | 003 | 003 | | | | | | | | | | | | YES | | | | | | | | | YES |
| 01 F | | | | | | | | | | | | | | | YES | | | | | | | | | | YES | | | | | |
| 01 P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RESPONDOR

| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | YES | | | YES | YES | YES | YES | | | 001 | | | | | | | | YES | YES | | 001 | YES | YES | | | 001 | 001 | YES | | YES |
| 01 H | YES | | | YES | | | | | | 002 | 001 | | | | | | | | | | | | | | | | | | | YES |
| 01 L | YES | | | YES | | | | | | 003 | 002 | YES | 001 | 001 | 001 | 001 | | YES | | | 002 | | | | YES | YES | YES | 002 | 002 | YES |
| 01 D | YES | | | YES | | | | | | 003 | | 002 | 002 | 002 | 002 | 002 | | | | | | | | | YES | YES | YES | 003 | 003 | YES |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

IF YOUR EXPERIENCE REFLECTS THAT U.S. LINE, INTERACTIVE PROGRAMMING IS AN EFFECTIVE TOOL, WHAT DO YOU FEEL THE IMPROVEMENT IN PROGRAMMER PRODUCTIVITY OVER CONVENTIONAL (BATCH) SOFTWARE DEVELOPMENT IS?

[illegible]

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QUESTION 242

APPROXIMATELY WHAT DOES IT COST YOU TO FIRM TO MAINTAIN A LINE OF

CODE DURING

A. FIRST YEAR AFTER DELIVERY S-----

B. SECOND YEAR AFTER DELIVERY S-----

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| PART/SUB | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
| 01 A | | | | | | | 005 | 005 | 005 | | | 005 | | 010 | | | | | | | | | | | | | | | | | |
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| PART/SUB | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
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| PARIS/SH | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
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|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 04 A | 050 | | | | | | | | | 070 | | | 100 | 100 | 100 | 100 | | | | | | 100 | 100 | 070 | 070 | 070 | 100 | 100 | | 100 |
| 04 B | 080 | | | | | | | | | 070 | | | 100 | 100 | 100 | 100 | | | | | | 025 | 025 | 005 | 005 | 005 | 100 | 100 | | |
| 04 C | 005 | | | | | | | | | | | | 010 | 010 | 010 | 010 | | | | | | 070 | 070 | 004 | 005 | 004 | 100 | 100 | | 010 |
| 04 D | 035 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 04 E | 070 | | | | | | | | | | | | 015 | 015 | 015 | 015 | | | | | | 015 | 015 | 005 | 005 | 005 | 100 | 100 | | |
| 04 F | 080 | | | | | | | | | 075 | | | | | | 020 | | | | 100 | | 100 | 100 | 015 | 015 | 015 | 100 | 100 | | 005 |
| 04 G | 050 | | | | | | | | | 075 | | | | | | 020 | | | | | | 100 | 100 | 015 | 015 | 015 | 050 | 050 | | 005 |
| 04 X | | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | MIS | | | | | | | | MIS | |

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AT WHAT STAGES IN THE DEVELOPMENT CYCLE ARE MANAGEMENT REVIEWS

- GENERALLY REQUIRED?
- A. SYSTEM REQUIREMENTS REVIEW (ADDED)
 - B. PRELIMINARY DESIGN
 - C. CRITICAL DESIGN
 - D. MODULAR DESIGN REVIEWS (FUNCTION) (ADDED)
 - E. FINAL CONFIGURATION
 - F. PHYSICAL CONFIGURATION AUDIT (ADDED)
 - G. FINAL TEST (ADDED)
 - H. COMPLETION OF TEST AND INTEGRATION PLAN (ADDED)
 - I. COMPLETION OF SYSTEM TEST & USER TEST PHASE (ADDED)
 - J. DURING EMERGENCY SITUATIONS (ADDED)
 - K. PROPOSED MILITARY ACTIONS (ADDED)
 - L. SPORADIC MANAGEMENT AUDITS (ADDED)
 - M. DO NOT EMPLOY MANAGEMENT REVIEWS
 - N. OTHER

RESPONSE

| PART/NO | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 B | YES | YES | YES | | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 C | YES | YES | YES | | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 E | YES | YES | YES | | YES | | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 01 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| 01 L | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| 01 F | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | |
| 01 F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

QUESTION 245

IS THERE ANY UNIQUE ASPECT TO THE PRINCIPAL FUNCTION OF YOUR
FIRM (UNLESS YOU ARE PRIMARILY A SOFTWARE DEVELOPMENT HOUSE)
THAT YOU HAVE BEEN ABLE TO ADAPT TO THE SOFTWARE DEVELOPMENT TASK?
A. -----
R. NO

| RESPONDOR | | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | |
|-----------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| RESPONDOR | | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | |
|-----------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| PART/SUB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 01 X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

SECTION 3

REFERENCE

INTRODUCTION

In preparing this survey, literally hundreds of books, articles, and papers were read. The results of this literature search became a general model of how software engineering project management was accomplished. This model is represented by the original questionnaire. It would be impractical in an informal report such as this to list all these publications particularly since many of the ideas contributed were general across many different publications. However, where one document was the source of most of one question (or a group of questions) or a unique definition was used (i.e., structural programming, HIPO, Chief Programmer, Orthodox Job Enrichment, etc.) a reference is given. We hope nobody was slighted.

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APPENDIX A

CONTRIBUTORS

INTRODUCTION

This appendix lists those individuals (usually project managers) and firms who completed the survey. This list is provided to: (1) acknowledge the contribution, hard work, and willingness to contribute to the general knowledge of computer science by these individuals, and (2) to lend credibility to this report by making visible the excellent source of the data.

These people and companies are all members and supporters of the AIAA Technical Committee on Computer Systems.

At the end of this list is a group of individuals that wished to remain anonymous in order that they could provide more candid, truthful answers.

It was obvious from the answers received that the contributors worked very hard making the answers as truthful as possible. Again, the authors thank you.

CONTRIBUTORS

Mr. Philip S. Babel
Technical Advisor for
Computer Systems
Acquisition

Simulator Systems Program Office
Aeronautical Systems Division
Wright-Patterson AFB, OH 45433

Mr. Francis J. Barrett
Chief, PEACE SIGMA
Development Unit

Data Automation Branch
Sacramento Air Logistics Center
McClellan AFB, CA 95652

Mr. Frank L. Bernstein
Vice President
Federal Systems Division

CALCULON Corporation
1501 Wilson Boulevard
Arlington, VA 22209

Mr. Herman S. Binder
Section Head, Systems Design
Analysis & Integration
Section

Grumman Aerospace Corporation
Bethpage, NY 11714

PRECEDING PAGE BLANK-NOT FILLED

Mr. M. Lenard Birns
Program Manager, Naval
Warfare Gaming System

Mr. Jack E. Bloodworth
Manager, ALCM Software

Mr. David A. Brown
Chief, ARRCs Development
Group

Mr. Allen G. Burgess
Manager, Computer Systems
Laboratory

Mr. George R. Cannon, Jr.
Manager of Vandenberg
Programs

Mr. Frank J. Cerulli
Director of Engineering
Computer Systems Division
also
Products Systems Division

Mr. James P. Chilton
Director, Data Processing
Sub Systems
Systems Technology Program

Mr. Arthur C. Ciccio
Associate Division Leader
Computer Science Division

Mr. James W. Clark
Manager of Engineering
Operations

Mr. Jerry E. Cummings
Program Analyst
Logistics Research &
Systems Division

Defense Systems Division
Computer Sciences Corporation
304 West Route 38, Box N
Moorestown, NJ 08057

The Boeing Aerospace Company
P. O. Box 3999
Seattle, WA 98124

Data Automation Branch
Sacramento Air Logistics Center
McClellan AFB, CA 95652

Equipment Division
Raytheon Company
528 Boston Post Road
Sudbury, MA 01776

Logicon, Incorporated
P. O. Box 1567
Vandenberg, CA 93437

Lockheed Electronics Company,
Incorporated
U.S. Highway 22
Plainfield, NJ 07061

McDonnell Douglas Astronautics
Company
5301 Bolsa Avenue
Huntington Beach, CA 92647

The Charles Stark Draper
Laboratories, Incorporated
555 Technology Square
Cambridge, MA 02139

United Technologies Research
Center
East Hartford, CT 06108

Directorate of Plans & Programs
Sacramento Air Logistics Center
McClellan AFB, CA 95652

Mr. G. Russell Curtis
Manager, Simulation & Data
Systems
Information Systems Programs

General Electric Company
450 Persian Drive
Sunnyvale, CA 94086

Mr. Alan J. Deerfield
Consulting Scientist

Submarine Signal Division
Raytheon Company
P. O. Box 360
Portsmouth, RI 02871

Mr. Edward M. Dunaye
Director, Quality Assurance

Planning Research Corporation
7600 Old Springhouse Road
McLean, VA 22101

Mr. Joe N. Dyer
Manager, Equipment Evaluation
& Systems Programming

Lockheed Missile & Space Company,
Incorporated
P. O. Box 504
Sunnyvale, CA 94088

Mr. Richard R. Erkeneff
Chief Design Engineer,
Data Control & Processing
Systems

McDonnell Douglas Astronautics
Company
5301 Bolsa Avenue
Huntington Beach, CA 92647

Mr. S. G. Evetts
Project Manager

Vought Corporation
P. O. Box 5907
Dallas, TX 75222

Dr. George R. Fath
Acting Manager
Avionics Development
Engineering

General Electric Company
901 Broad Street
Utica, NY 13503

Mr. Herb Finnie
Manager, PLSS Software
Development

Lockheed Missile & Space Company,
Incorporated
P. O. Box 504
Sunnyvale, CA 94088

Mr. J. I. Freeman
Avionics Project
Engineering

Vought Corporation
P. O. Box 5907
Dallas, TX 75222

Dr. Virgil "Smokey" V. Griffith
Chief, Electronics Engineer
Digital Computer & Software
Engineering

McDonnell Aircraft Company
P. O. Box 416
St. Louis, MO 63166

Mr. Harvey I. Gold
Manager, Software Technology
Department

System Development Corporation
2400 Colorado
Santa Monica, CA 90406

Dr. Kenneth A. Hales
Manager, MSP Mission Control
& Software

The Boeing Aerospace Company
P. O. Box 3999
Seattle, WA 98124

Mr. Uwe W. Ibs
Design Specialist

Pomona Division
General Dynamics Corporation
P. O. Box 2507
Pomona, CA 91766

Dr. Peter R. Kurzhals
Director, Guidance, Control &
Information Systems Division

Headquarters National Aero-
nautics & Space Administration
Washington, DC 20546

Mr. John C. Lemanczyk
Manager, Software Technology
Development

Grumman Aerospace Corporation
Bethpage, NY 11714

Mr. Myron Lipow
Senior Staff Engineer,
Product Assurance
Systems Engineering &
Integration Division

Defense & Space Systems Group
of TRW, Incorporated
One Space Park
Redondo Beach, CA 90278

Mr. Austin Maher
Manager, Software

Kearfoot Division
The Singer Company
Little Falls, NJ 07424

Dr. John H. Manley
Assistant to the Director

Applied Physics Laboratory
The Johns Hopkins University
Johns Hopkins Road
Laurel, MD 20810

Dr. Robert R. McCready
Applied Mathematician

Vought Corporation
P. O. Box 5907
Dallas, TX 75222

Mr. H. Lewis Parker
Manager, Mini/Micro Based
Systems Department

COMSTAT Laboratories
22300 Comstat Drive
Clarksburg, MD 20734

Dr. Leon Pressor
President

Softool Corporation
340 S. Kellogg Avenue
Goleta, CA 93017

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Dr. Terry A. Straeter
Head, Programming Technologies
Branch

Langley Research Center
National Aeronautics & Space
Administration
Hampton, VA 23665

Mr. Herbert D. Strong, Jr.
Manager, ADP Management Office
Flight Projects Support Office

Jet Propulsion Laboratory
California Institute of
Technology
4800 Oak Grove Drive
Pasadena, CA 91103

Mr. R. L. Van Tilburg
Senior Scientist
Computer Programming Laboratory

Hughes Aircraft Company
P. O. Box 3360
Fullerton, CA 92634

Mr. Gene F. Walters
Manager, Software Technologies
Information Systems Program

General Electric Company
450 Persian Drive
Sunnyvale, CA 94086

Mr. Lynn S. Wilson
Director, West Coast Operations

Grumman Data Systems Corporation
16133 Ventura Blvd., Suite 675
Encino, CA 91436

Mr. Eric W. Wolf
Manager, Washington Operations

Bolt Beranek & Newman,
Incorporated
1701 No. Fort Myer Drive
Arlington, VA 22209

Anonymous
Technical Advisor for
Computers

Engineering & Development
Organization
Large Government Agency
(Military)

Anonymous
Manager, Communication Analysis

Electronic Systems
Large Manufacturing Company

Anonymous
Chief, Scientific Applications
Analysis Branch

Research Center
Large Government Agency
(Non-Military)

Anonymous
Tech Director, Simulation
Division

Software and Engineering
Large Manufacturing Company

Anonymous
Senior Engineering Specialist
Avionics Software

Aircraft Development
Large Aerospace Corporation

APPENDIX B
QUESTIONNAIRE

INTRODUCTION

This appendix contains Part One of the questionnaire. Other reports will contain the balance of the questionnaire.

The questionnaire as printed in this report is a modified version of the questionnaire as originally answered. This was done for the following reasons:

(1) Not all questions had accompanying multiple choice answers but were narrative in nature.

(2) The original questionnaire contains space for project managers to add their own comments as answers to the questions rather than select one of the pre-given answers, and

(3) There were errors in the original survey which needed correcting.

The procedures used to report on those questions that did not have preselected answers was to modify the original questionnaire to make it "look like" the authors had preselected these possible answers and the participants had checked them. In truth, the answer set was derived from the submitted answers. To indicate which questions were originally narrative in form, a notation in parenthesis following the question will indicate "originally narrative."

In addition, the original questionnaire contained space for project managers to add their own comments as answers to the questions rather than select one of the pre-given answers. This was encouraged by the author in order to insure that the answers to the questionnaire were as accurate as possible and not distorted by forcing the participant to only select from pre-conceived answers. Again, to provide structure so the answers can be encoded in a computer data base system, the "comment" answers were grouped and the possible "answer set" expanded to include these answers. To indicate these additional answers the word "added" will be placed in parenthesis at the end of the question.

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In contrast, Question 45 was left in narrative form. This question was answered by encoding the answers and entering this code on the tabulation sheets.

Other modifications were made to the original questionnaire where the participants indicated the question was poorly worded or where the participants modified the original question by the insertion of a word or phrase. The author inserted these in the interest of making this version of the questionnaire more complete. These additions to the original questions and/or original answers are indicated by placing the added portion in brackets "[]" and placing the word "added" in parenthesis at the end of the question or answer.

The author hopes that the above explanations do not appear to be too complex. It was done purely in the interest of conveying the maximum amount of information to the reader about the original questions and the possible answers presented to the respondent.


References were added where they were needed or where the addition of a reference would make the question clearer. An abbreviated source is contained in brackets "[]" and the complete source follows this appendix.

RULES AND CONDITIONS FOR PARTICIPATING IN SURVEY

It is important that no company, or individual suffer any loss of proprietary information or receive unfavorable publicity as a result of this survey. Each individual participating in the survey has our full assurance that the data he provides will be treated in accordance with the above principles. In order to achieve this we stipulate the following:

1. Unless specifically authorized, the names of participating firms, or individuals will not be listed in the report as contributors.
2. The anonymity of the company, department, individual, and project will be preserved in every instance.
3. Any proprietary or company confidential information, if so identified (by writing "CONF" beside the question) will be protected and used only in deriving statistical data.
4. The individual completing the questionnaire can omit the answer to any question without invalidating the questionnaire.
5. Only if cleared for further dissemination will raw data (completed forms) be made available to the participating AIAA TC members, should such request be made, to assist them in research work of their own. Without exception, all company, department, project, and individual names, as well as responses identified as "CONF" will be systematically deleted prior to release.
6. If so requested by the submitter, only statistical data will be derived from the survey, and the survey form destroyed upon publication of the final report.

Though it is seen as providing benefits to all participants, including the U.S. Air Force, this survey is not sponsored by the U.S. Air Force, or any individual, group, committee, or company, and does not imply any obligation on the part of the participants. It is being accomplished solely to provide data to be presented at the AIAA Conference, Computers in Aerospace, 31 Oct - 2 Nov 1977, Los Angeles, California.


RICHARD H. THAYER
JOHN H. LEHMAN

MEMO OF UNDERSTANDING

I make the following stipulations under which this survey can be used: (Please sign each stipulation you wish to make as precondition to submitting this survey. Line through those paragraphs which do not apply.)

This survey with company, department, project and other identifying markings, and with all answers marked "CONF" deleted can be duplicated and provided to the TC members at their request.

Signature of Submitter

This survey can only be used to provide statistical data and cannot be released to the TC members for their use in any but a composite statistical or summary form. Following publication of final report both this form and the survey must be destroyed by shredding, pulping, or similar means.

Signature of Submitter

I authorize the release of the firm name in a list of participants to be included as an addendum to the final report. The desired name, title, etc., is:

Signature of Submitter

A SURVEY OF MANAGEMENT TECHNIQUES AND PROCEDURESEMPLOYED IN SOFTWARE DEVELOPMENT PROJECTS

INSTRUCTIONS

Each survey packet comprises three parts. The number of packets provided will, in most cases, match the number of projects to be reported on plus one spare. If more forms are required you may copy or call.

PART ONE of the survey deals with defining the total organization and the overall management structure, requirements, and philosophy, and is intended to be answered by top management. It provides the backdrop against which the individual projects are to be viewed. Normally, only one copy of PART ONE should be completed per mailing, but each packet contains PARTS ONE, TWO, and THREE for the sake of uniformity and the chance that, in some instances, additional PART ONES would be called for.

A PART TWO is to be completed for each project reported on, and is intended to be completed by the project manager. (It is assumed the project is completed or almost completed) If these methods now often referred to as Modern Programmer Productivity Techniques (top down design, structured programming, et al.) are being used in whole, or in part, in your development activities, you should consider selecting a representative sample of before and after projects in completing the survey.

PART THREE consists of general questions not related to any specific project, and is also intended to be completed by a project manager. One PART THREE is included in each packet on the assumption that each project will be reported on by a different project manager. If one manager reports on more than one project, he or she would only complete PART THREE one time.

The dynamic nature and infinite diversity of the entire field of Data Processing has kept the jargon from becoming universally defined. For this reason we have attempted to avoid terms that might have more than one meaning. If questions appear vague or imprecise, feel free to call for clarification. Or, if you prefer, rewrite the question to ask what you believe the point to have been, or to relate it to your particular environment.

The answers provided for each question are not the universal set of possible responses, so, if you believe selecting one of the canned replies would be misleading please select "other" or "comment" and explain. If more space is required, write in the margins indicating the number of the question being answered. If a question defies

answering either through complexity, non-relevance to your environment, or excessive research feel free to leave it blank or enter an appropriate comment. If you write "CONF" in the left margin adjacent to any question, that response will be treated as confidential/proprietary data as described under "Rules and Conditions..", attachment 1 to the basic letter.

If possible, avoid direct reference to specific firms, projects, and people. Each set of questionnaires has been numbered in order that we might keep related responses together and facilitate accounting. Base numbers have been selected at random and no algorithm has been employed that would facilitate pairing firms with forms.

We very much appreciate the time and effort you're putting into this. Your time, effort, and candor are essential to the success of our joint effort.

Please return the completed surveys in the return envelope provided or mail to:

Colonel Richard H. Thayer
SM-ALC/ACD
McClellan AFB, CA 95652

A SURVEY OF MANAGEMENT TECHNIQUES AND PROCEDURES
EMPLOYED IN SOFTWARE DEVELOPMENT PROJECTS

PART ONE (Modified)

INTRODUCTION. PART ONE of the survey pertains to the company or firm as a whole (a major division of a very large corporation, e.g., IBM - Federal Systems Division, General Dynamics - Fort Worth, Grumman Data Systems Corporation, NASA Langley Research Center is considered to be an independent company/firm for the purpose of this survey). PART ONE deals with defining the total organization and the overall management structure, requirements, and philosophy and is intended to be answered by a senior ADP or other senior manager in the company.

THE IDENTIFICATION NUMBER ASSIGNED TO THIS PACKET IS _____.

Please return the completed Questionnaire in the envelope provided or mail to:

Colonel Richard H. Thayer
SM-ALC/ACD
McClellan AFB, CA 95652

1. What position do you hold in the company? (Originally narrative)
- a. Senior Corporate Officer (President, Vice President, Executive Officer, etc) []
 - b. Senior ADP Officer []
 - c. Senior Functional Area (Non ADP) Manager (i.e., Director of Engineering, Manager Airframe Development, Chief of Production, Program Manager) []
 - d. Project Manager Software Development []
 - e. Technical Director, Quality Assurance, IV&V Supervisor, etc []
 - f. Senior Corporate Staff []
 - g. Project Individual []
 - y. None of the above []
 - z. Other/Comment if necessary _____ []
- _____
- _____

2. What is the title/position of the senior ADP officer in the firm? (e.g., Vice President in Charge of Data Services)
(Originally narrative)

- a. Corporate Officer (President, Vice President, Executive Officer, etc.) []
- b. Chief (Vice President, Director, Managing Head) Data Processing (Computing, Information Systems, Data Services, Data Automation, etc.) []
- c. Assistant Controller (Financial Manager, etc.) []
- d. Software Analysis (Engineer, Developer, etc.) []
- y. Not applicable to organizational structure []
- z. Give Title/Comment if necessary _____ []

3. What is the title/position of the individual to whom the senior ADP officer reports? (e.g., President, Comptroller)
(Originally narrative)

- a. Corporate Officer (President, Vice President, Executive Officer, etc.) []
- b. Comptroller (Vice President for Finance, etc.) []
- c. Senior Functional Area (non ADP) Manager (Director/Chief of Engineering, Research, Operations, etc.) []
- d. Functional Area Supervisors []
- y. Not applicable to organizational structure []
- z. Other/Comment if necessary _____ []

4. What are the titles/positions of the individuals reporting directly to the senior ADP officer? (e.g., Chief, Software Development Division)

- a. _____ []
- b. _____ []
- c. _____ []
- d. _____ []
- e. _____ []
- f. _____ []
- y. None/Not applicable to organizational structure (added) []
- z. Comment if necessary _____ []

5. What is a typical line of authority from senior ADP officer [or senior corporate officer over project] through Software Development Project Manager? (added)

- a. Senior ADP officer (or _____) to []
- b. _____ to c. _____ to []
- d. _____ to e. _____ to []
- f. _____ to g. _____ to []
- h. Software Development Project Manager []
- y. Not applicable to organizational structure []
- z. Comment if necessary _____ []

6. Software Development Project Managers are normally:

- a. Functionally oriented (accountant for accounting application, logistician for logistics application, [engineering, etc.] (added) []
- b. ADP management oriented []
- c. Senior software analysts []
- d. Senior software analysts/programmers []
- e. Professional Project Managers (generalist) (added) []
- y. None of the above (added) []
- z. Other: _____ []

7. The firm is primarily: [Taken partly from Computer Survey Subscription Form, 1 June 1977]

- a. A manufacturer of computer hardware []
- b. A manufacturer of other than computer hardware []
- c. A "software house" []
- d. An engineering service and technical support organization []
- e. The Government: federal (non-military), federal (military), state, county, municipal []
- f. A university or educational institution []
- g. A computer service bureau, time-sharing service []
- h. An ADP consultant and/or education service []
- i. Financial: banking, insurance, real estate, securities, credit []

- j. In the wholesale or retail trade []
 - k. In medical or legal services []
 - l. In transportation services []
 - m. Utilities: communications, electric, gas []
 - z. Other/Comment: _____ []
-

8. The firm is:

- a. Operated for a profit []
- b. Non-profit organization []
- c. Government agency []
- y. None of the above []
- z. Other: _____ []

9. The firm has _____ principal locations. (e.g., Factory in Peoria, mine and smelter in Ashtabula, Home office in Newark: = 3 locations)

10. Software system development is carried on at _____ of these locations.

11. Gross revenues (Budget for Government Agencies) for last year reported (197_) were: (added)

- a. Less than 200 thousand dollars []
- b. Between 200 thousand and 1 million dollars []
- c. Between 1 million and 10 million dollars []
- d. Between 10 million and 50 million dollars []
- e. Between 50 million and 100 million dollars []
- f. Between 100 million and 500 million dollars []
- g. Between 500 million and 1 billion dollars []
- h. In excess of one billion dollars []
- z. Other: _____ []

12. What percent of [Total] revenue is derived from software development? [For software developed for profit] (added)

- a. Less than 10% []
- b. Between 10% and 25% []
- c. Between 25% and 50% []
- d. Between 50% and 75% []

- e. Over 75% []
- f. All revenue derived from software development []
- y. [Not Applicable]/All development done for in-house customers (added) []
- z. Other: _____ []

13. What percent of the [total profits] annual budget is devoted to software development activities? [For software not developed for profit/government agencies] (added)

- a. Less than 10% []
- b. Between 10% and 25% []
- c. Between 25% and 50% []
- d. Between 50% and 75% []
- e. Over 75% []
- y. Not applicable (added) []
- z. Comment: _____ []

14. How many people:

- a. Are employed by the firm _____
- b. Work in all aspects of ADP _____
- c. Are devoted to Software Development activities _____
- z. Comments: _____ []

15. Who exercises approval authority for major software developed for in-house use?

- a. Corporate Officer (President, Vice President, etc.) (added) []
- b. Senior Functional Area Manager (added) []
- c. Comptroller []
- d. Director of data processing [Senior ADP official] (added) []
- e. Executive one step above functional area involved []
- f. Selection Committee (added) []
- g. Project Manager (added) []
- h. Executive requesting system through some form of internal budget scheme [Requirement Document] (added) []
- y. Software not developed for in-house use (added) []
- z. Other: _____ []

16. In this question we wish to ascertain which forms of contract you employ and which you prefer in each of three situations. In responding you may either check the answer or provide a rank ordering of those answers that apply. The first situation related to your being the contractor providing software development for a user or customer. The second situation reverses this and places you in the user or customer role. The final situation concerns the form of agreement that is employed when software is developed for in-housers. [ASPR, 1976]

| <u>Contract Type</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> | <u>F</u> |
|---|-------------------|---------------|---------------------|---------------|---------------------|---------------|
| | <u>You are</u> | | <u>You Contract</u> | | <u>Develop for</u> | |
| | <u>Contractor</u> | | <u>For</u> | | <u>In-House Use</u> | |
| | <u>Use</u> | <u>Prefer</u> | <u>Use</u> | <u>Prefer</u> | <u>Use</u> | <u>Prefer</u> |
| a. Firm fixed price | [] | [] | [] | [] | [] | [] |
| b. Fixed price with economic price adjustment | [] | [] | [] | [] | [] | [] |
| c. Fixed price incentive | [] | [] | [] | [] | [] | [] |
| d. Firm fixed price level of effort | [] | [] | [] | [] | [] | [] |
| e. Cost | [] | [] | [] | [] | [] | [] |
| f. Cost sharing | [] | [] | [] | [] | [] | [] |
| g. Cost plus incentive fee | [] | [] | [] | [] | [] | [] |
| h. Cost plus award fee | [] | [] | [] | [] | [] | [] |
| i. Cost plus fixed fee | [] | [] | [] | [] | [] | [] |
| j. Time and materials | [] | [] | [] | [] | [] | [] |
| k. Labor-hour | [] | [] | [] | [] | [] | [] |
| l. Basic ordering agreement | [] | [] | [] | [] | [] | [] |
| y. None (added) | [] | [] | [] | [] | [] | [] |
| z. Other: _____ | [] | [] | [] | [] | [] | [] |

17. Do you use two phase contracts in which: phase one analyzes the requirements, determines feasibility, and estimates costs, and phase two directs development?

| | <u>A</u> | <u>B</u> | <u>C</u> |
|--|-------------------|----------|---------------------|
| | <u>You are</u> | | <u>You Contract</u> |
| | <u>Contractor</u> | | <u>For</u> |
| | | | <u>Develop for</u> |
| | | | <u>In-House Use</u> |
| a. Always use them | [] | [] | [] |
| b. Prefer them on projects of any size | [] | [] | [] |
| c. Encourage their use on major projects | [] | [] | [] |

- d. Sometimes use them (added) ☐ ☐ ☐
- e. Hardly ever use them (added) ☐ ☐ ☐
- f. Discourage their use in
all but extreme cases ☐ ☐ ☐
- y. Never use them ☐ ☐ ☐
- z. Comment: _____

18. If an incentive clause is included in the contract, what is the incentive normally based on?

- | | <u>A</u> | <u>B</u> | <u>C</u> |
|--------------------------|--------------------------|--------------------------|-----------------------------|
| | You are Contractor | You Contract For | Develop for In-House Use |
| a. Reduced cost | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Early delivery | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Increased performance | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Quality factors | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| y. Not used (added) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| z. Other: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

19. Are bonuses or incentives paid for early/on time completion of software development projects?

- a. Yes, for key personnel ☐
- b. Yes, for other than management positions ☐
- c. Yes, for all individuals engaged full time on the project ☐
- d. Yes, to project manager on fixed price contracts (added) ☐
- e. Yes, based on individual performance (added) ☐
- f. Yes, management incentive program (added) ☐
- g. Yes, higher award fee on contract (added) ☐
- y. No (bonuses or incentive paid) (added) ☐
- z. Other: _____ ☐

20. Have procedures been employed in which programmers or analysts bid on specific tasks in the development of projects? e.g., "I'll write the edit program for \$1,217.12."

- a. Yes ☐
- b. No ☐
- z. Comment: _____ ☐

21. If bidding as described above was employed, how successful has it proven to be?

- a. Very []
- b. Moderate []
- c. Unsuccessful []
- y. Not employed []
- z. Useful only under the following condition(s) _____ []

22. In most instances:

- a. Software development projects are handled within the ADP environment with functional analysts or prospective users being assigned or attached to the development team. []
- b. ADP specialists are detailed or assigned to the functional user for the duration of the development effort. []
- y. None of the above (added). []
- z. Other: _____ []

23. Teams are typically made up of:

- a. Permanent employees _____ %
- b. Temporary hires employed for duration of project _____ %
- c. Consultants hired at daily/weekly/monthly rate _____ %
- z. Other: _____

24. If possible, outline the composition of a typical large development team as it would be employed in your firm. To place the team in context a hypothetical project description may be included (e.g., Development of an on-line air cargo manifesting capability).

Hypothetical project description (optional):

Fractions may be used to indicate that the position is not considered a full time job. The following is an example of the notation to be used if one individual occupies more than one position.

- f. Administrator _____ 1/3 (g)
- g. Librarian DESIGN ASSISTANT _____ 2/3 (f)

The letter in parenthesis is intended to tie the same individual to positions f and g.

| <u>Position Title</u> | <u>A</u> <u>Title Used by Your Firm</u> | <u>B</u> <u>Number</u> |
|---|--|---------------------------|
| a. Project Manager | _____ | _____ |
| b. Asst. Proj. Mgr. | _____ | _____ |
| c. Senior Analyst | _____ | _____ |
| d. Team Chief | _____ | _____ |
| e. Asst. Team Chief | _____ | _____ |
| f. Administrator | _____ | _____ |
| g. Librarian | _____ | _____ |
| h. Application Anal. | _____ | _____ |
| i. Functional Anal. | _____ | _____ |
| j. Applications Prog. | _____ | _____ |
| k. Oper. Sys. Prog. | _____ | _____ |
| l. Tester | _____ | _____ |
| m. Integrator | _____ | _____ |
| n. Data Base Designer (added) | _____ | _____ |
| o. Data Base Administrator (added) | _____ | _____ |
| p. Transition to Production Interface (added) | _____ | _____ |
| q. Quality Assurance (added) | _____ | _____ |
| r. Staff Assistant to Assistant Proj. Manager (added) | _____ | _____ |
| s. Documentation Aids (added) | _____ | _____ |
| t. Hardware Engineers (added) | _____ | _____ |
| y. None of the above (added) | _____ | _____ |
| z. Other: _____ | _____ | _____ |

25. What is the normal/typical progression to the position of Project Manager, e.g., programmer, analyst, lead programmer, project manager? [(Indicate by putting number opposite position used in order of progression starting with "1" on lowest position and ending with Project Manager)] (added) (Originally narrative)

| | |
|---------------------------------------|-----|
| a. Associate Programmer | [] |
| b. Junior Programmer/Analyst | [] |
| c. Junior Analyst | [] |
| d. Work Unit Leader | [] |
| e. Assistant Engineer | [] |
| f. Software Engineer | [] |
| g. Associate Engineer | [] |
| h. Programmer | [] |
| i. Associate Programmer/Analyst | [] |
| j. Senior Programmer | [] |
| k. Systems Analyst | [] |
| l. Programmer/Analyst | [] |
| m. Lead Analyst | [] |
| n. Lead Engineer | [] |
| o. Chief Avionics Engineer | [] |
| p. Lead Programmer | [] |
| q. Staff Programmer/Analyst | [] |
| r. Head Programmer | [] |
| s. Senior Programmer/Analyst | [] |
| t. Task/Work Package Manager | [] |
| u. Engineer | [] |
| v. Team Chief | [] |
| w. Senior Systems Analyst | [] |
| aa. Data Systems Specialist | [] |
| bb. Supervisor | [] |
| cc. Department Head | [] |
| dd. Chief Engineer | [] |
| ee. Senior Engineer | [] |
| ff. Software Systems Engineer | [] |
| gg. Software Development Manager | [] |
| hh. Deputy/Associate Project Manager | [] |
| ii. Scientific Programming Specialist | [] |
| jj. Group Leader/Software Development | [] |
| kk. Advisory Analyst | [] |

- ll. Project Leader []
- mm. Project Engineer []
- nn. First Line Supervisor []
- oo. Second Line Manager []
- pp. Engineering Manager []
- qq. Project Manager []
- y. No pattern []
- z. Other: _____ []

26. Are applications analysts also computer programmers?
- a. Always []
 - b. More than half of our analysts are also programmers []
 - c. Less than half of our analysts are also programmers []
 - d. Very rarely is an analyst also a programmer []
 - e. Varies depending on type of work (added) []
 - z. Comment: _____ []

27. What is your approximate ratio between straight programmers and analysts (programmer/analysts)? [Fill in number opposite a or b title to indicate ratio] (added) (Originally narrative)
- a. Programmers []
 - b. Analysts/Programmer Analysts []
 - c. Varies, depending on situation []
 - y. None/very few straight programmers or analysts []
 - z. Comment: _____ []

28. Which manual reporting procedures are used in project monitoring and management? At what level do they originate, and how high do they go? How often are they aggregated, condensed, or edited as they move through the chain?

| | <u>A</u> | <u>B</u> | <u>C</u> |
|-----------------------------------|------------------------------------|------------------------------------|-----------------------------------|
| <u>REPORT TITLE</u> | <u>LOWEST</u> <u>ORIGINATOR</u> | <u>HIGHEST</u> <u>RECIPIENT</u> | <u>NO. OF</u> <u>AGGS/EDTS</u> |
| a. Weekly Activity | _____ | _____ | _____ |
| b. Project Status | _____ | _____ | _____ |
| c. Significant Change | _____ | _____ | _____ |
| d. Cost vs Performance (added) | _____ | _____ | _____ |

- e. _____
- f. _____
- y. No manual reporting system used/unknown ☐ ☐ ☐
- z. Comment: _____ ☐

29. Which automated reporting systems are used in project monitoring and management?

- | | <u>A</u> | <u>B</u> |
|--|--------------------------|--------------------------|
| | LOWEST ORIGINATOR | HIGHEST RECIPIENT |
| a. Manhour by Activity (e.g., code, flow diagram, etc.) | _____ | _____ |
| b. Manday by Task (e.g., prepare users guide, design data base etc.) | _____ | _____ |
| c. _____ | _____ | _____ |
| d. _____ | _____ | _____ |
| y. No automated reporting systems used | <input type="checkbox"/> | <input type="checkbox"/> |
| z. Comment: _____ | | |

30. Which commercial, or what locally developed software is employed to assist in the development task? (e.g., LIBRARIAN, Applied Data Research) (If system is of local origin give very brief description, e.g., structured pre-compilers, automatic flowcharters, etc.)

- | <u>A</u> | <u>B</u> |
|---|--|
| <u>NAME</u> | Vendor, or if locally developed, give brief description. |
| a. _____ | _____ |
| b. _____ | _____ |
| c. _____ | _____ |
| d. _____ | _____ |
| e. _____ | _____ |
| f. _____ | _____ |
| g. _____ | _____ |
| h. _____ | _____ |
| i. _____ | _____ |
| y. No commercial or locally developed software employed to assist in development tasks. | <input type="checkbox"/> |

31. If you purchase software aids/packages from external developers approximately what percent is purchased (versus developed in-house)? _____ %

32. Does the firm have a special organization or group that aids the project manager in selecting software development aids/packages?

- a. Yes (Title: _____) []
 b. No []
 z. Comment: _____ []

33. Are software aids primarily written in assembly language as opposed to a higher order language such as COBOL?

- a. Yes []
 b. No (what language): _____ []
 c. Varies widely (added) []
 y. None used (added) []
 z. Comment: _____ []

34. Which software development aids (e.g., copy library) supplied by the hardware manufacturer do you use to assist in application system development?

- | <u>A</u> | <u>B</u> |
|--------------------------|---------------------|
| <u>NAME</u> | <u>Manufacturer</u> |
| a. _____ | _____ |
| b. _____ | _____ |
| c. _____ | _____ |
| d. _____ | _____ |
| e. _____ | _____ |
| y. Don't use any of them | [] |

35. In monitoring system development, system software is used to:

- a. Count compiles per modules []
 b. Count lines of code produced []
 c. Check for adherence to coding conventions []
 d. Check for use of standard data element names []
 e. Measure spare time (added) []
 f. Restrict access to specific areas of memory (added) []
 g. Keep track of data sets and storage usage (added) []
 h. Monitor execution time (added) []

- i. Number of times program modules are executed (added) []
 - j. Monitor Queue (length) (added) []
 - k. Provide proper timing information (added) []
 - l. Provide program resource utilization data (added) []
 - y. Do not use software to monitor system development []
 - z. Other: _____ []
36. List manually derived productivity indexes such as lines of code, program errors, turn arounds required per completed task, etc., that you employ in monitoring performance.
- a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 - y. Don't use productivity indexes []
37. If you are presently using on-line, interactive programming, check and fill in those answers which apply.
- a. We are presently starting to use on-line interactive programming. []
 - b. We have been using on-line, interactive programming since 19____. []
 - c. We presently employ on-line, interactive programming on _____% of the projects for which hardware and software support for the capability are available. []
 - y. Do not use on-line, interactive programming []
 - z. Comment: _____ []
38. Our experience to date indicates that on-line, interactive programming is:
- a. A highly effective development tool []
 - b. Effective in some cases []
 - c. Of limited utility []
 - d. A drain on hardware resources []
 - e. Inefficient use of personnel (expensive) (added) []
 - f. A nice toy []
 - y. No experience with on-line, interactive programming []
 - z. Other: _____ []

39. If your experience reflects that on-line, interactive programming is an effective tool, in which situation is it most effective? (Check or rank order)

- a. During development of code []
- b. To try short length of code for possible use (simulation approach) []
- c. During debugging []
- d. During testing []
- e. During routine runs (added) []
- f. To do quick and dirty jobs (added) []
- g. Scientific analysis (added) []
- h. As a support tool to update data (added) []
- i. Not an effective tool []
- y. Do not use on-line, interactive programming []
- z. Other: _____ []

40. If your experience reflects that on-line, interactive programming is an effective tool, what do you feel the improvement in programmer productivity over conventional (batch) software development is?

- a. Not an improvement []
- b. Some improvement []
- c. 1.5:1 improvement []
- d. 2:1 improvement []
- e. 3:1 improvement []
- f. 5:1 improvement []
- g. Very great improvement (not measured) (added) []
- h. Do not know (added) []
- i. Not measurable (added) []
- y. Do not use on-line, interactive programming []
- z. Other: _____ []

41. Approximately what does it cost your firm to product a line of code from requirement specifications to software delivery?

- a. lower range (added) \$ _____
- b. upper range (added) \$ _____

42. Approximately what does it cost your firm to maintain a line of code during

- a. First year after delivery \$ _____
- b. Second year after delivery \$ _____
- z. Comment on trend: _____

43. Which of the following procedures and techniques have been employed in software development activities in your firm? In providing answers only rough approximations are required. Also indicate if, in your judgement, the practice or procedure will increase or decrease in the foreseeable future?

| <u>Proc/Tech</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>D</u> | <u>E</u> |
|-------------------------------------|--------------|---------------|-------------|-------------|----------------|
| | <u>Start</u> | <u>Discon</u> | <u>High</u> | <u>Pres</u> | <u>Inc/Dec</u> |
| a. Team Concept [Baker, 1972] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| b. Devel Supt Lib [Baker, 1972] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| c. HIPO's [IBM, 1975] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| d. Pseudo Code [Youndon, 1976] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| e. Walk thru's [Weinburg, 1971] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| f. Top Down Des. [Youndon, 1976] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| g. Top Down Impl [Youndon, 1976] | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| h. Bottom up Design (added) | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| i. Bottom up Implementation (added) | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| j. Fire Fighting (added) | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| k. Structured Programming (added) | <u>19</u> | <u>19</u> | <u>%</u> | <u>%</u> | _____ |
| y. Don't use | [] | [] | [] | [] | [] |
| z. Other: _____ | [] | [] | [] | [] | [] |

44. At what stages in the development cycle are management reviews generally required?

- a. System Requirements Review (added) []
- b. Preliminary design []
- c. Critical design []
- d. Module Design Review (function) (added) []
- e. Final configuration audit []
- f. Physical configuration audit (added) []

- g. Final test (added) ☐
- h. Completion of test and integrating plan (added) ☐
- i. Completion of system test and user test phase (added) ☐
- j. During emergency situations (added) ☐
- k. Preselected milestones (added) ☐
- l. Sporadic management audits (added) ☐
- y. Do not employ management reviews ☐
- z. Other: _____ ☐

45. Is there any unique aspect to the principal function of your firm (unless you are primarily a software development house) that you have been able to adapt to the software development task?

y. No ☐

REFERENCES FOR QUESTIONNAIRE

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APPENDIX C
COMMENTS ON AND ABBREVIATIONS USED IN
THE REDUCTION OF ANSWERS

INTRODUCTION

The purpose of this appendix is to present comments on specific questions, relationships between questions and their answers, procedures used in contriving missing answers, and to list and describe the abbreviations and codes used in this report.

To conserve space and to provide a means of using a computer for analysis, all answers were abbreviated and/or coded (abbreviations and codes will be called just codes for the balance of this report). Because of space limitations and to assist in ease of processing, all alphanumeric codes were restricted to exactly three characters. The use of codes also had an additional advantage; it effectively disguised the answers so that the participants continue to remain anonymous.

The author did not comment on all the questions and answers. If the author had a comment, discussion, or observation on a question, his comments immediately follow the question number. Codes will immediately follow comments. If there are no comments, the codes will follow the question number. If the author has no comment or codes concerning a given question, the question number will be passed by.

Four types of codes were used. The first type was general, applies to all questions, and will be defined after this introductory section. The second type was applicable to only one answer and appears after the question number in this section. The third type of code was general across two or more questions (e.g., FOR for FORTRAN; GPC for general purpose computer), and was listed once the first time it is used. Therefore, all Type Two and Three codes were defined after the question number in which they first appear. The code was separated from its explanation by a dash (--).

The fourth code type applied to question 45. This question was strictly narrative in nature and did not lend itself to multiple choice. Each separate answer was given a separate code.

The author attempted to use codes that were easy to recognize (mnemonic) to reduce the amount of flipping between appendixes.

The letters a through z indicated the sub-parts of the questionnaire. Parts a through w were general questions. Part x was used to indicate the entire question was not answered (i.e., skipped). Part y was used primarily to show "none" of the answers applied or the questions were "not applicable". Part z was used for "other" answers.

TYPE ONE CODES

The code "YES" on the listing opposite a question (Sub-parts a through w) indicated that the surveyee "checked" the answer without comment and the answer is "yes" or "true." If a given question has a "blank" for an answer this indicates that the surveyee answered "no", or that the answer is "false" (this cannot be assumed if the surveyee did not answer at least one part in a multiple-part question).

Sometimes a pseudo question, Sub-part x, was created to indicate that the surveyee did not provide an answer to a given question because he: 1) did not understand the question, 2) felt it did not apply to his project or organization, or 3) just did not feel like answering it. This was done so that the reader would not read a "no" when the correct answer was unknown to the author. Sometimes the surveyee wrote in "unknown," otherwise it was coded "MIS" by the author.

When answered, Sub-part y was coded "NON" to mean that the whole question was answered "no" or "none". The answer to Sub-part y was frequently supplied by the author, therefore, one of the "C" codes was used (see later discussion). Sub-part z was coded "OTH" to mean that the surveyee's question was not answered (i.e., skipped). Part y was used primarily to show "none" of the answers applied or the questions were "not applicable". Part z was used for "other" answers.

TYPE ONE CODES

The code "YES" on the listing opposite a question (Sub-parts a through w) indicated that the surveyee "checked" the answer without comment and the answer is "yes" or "true." If a given question has a "blank" for an answer this indicates that the surveyee answered "no", or that the answer is "false" (this cannot be assumed if the surveyee did not answer at least one part in a multiple-part question).

Sometimes a pseudo question, Sub-part x, was created to indicate that the surveyee did not provide an answer to a given question because he: 1) did not understand the question, 2) felt it did not apply to his project or organization, or 3) just did not feel like answering it. This was done so that the reader would not read a "no" when the correct answer was unknown to the authors. Sometimes the surveyee wrote in "unknown" otherwise it was coded "MIS" by the author.

When answered, Sub-part y was coded "NON" to mean that the whole question was answered "no" or "none". The answer to Sub-part y was frequently supplied by the author, therefore, one of the "C" codes was used (see later discussion). Sub-part z was coded "OTH" to mean that the surveyee wrote in another answer and the author was not able to use it any other way (see discussion Appendix B).

As an added note, answers to Sub-parts a through w and z, Sub-part x and Sub-part y are mutually exclusive.

Several of the questions are multi-part. It is assumed that if a surveyee answered any one part of the multi-part question "yes" or "true" then all parts of the questions were answered. Any answers that were not checked were "no" or "false."

Other Type One codes are listed below. These codes were frequently used when the surveyee did not answer a question but made some comment in the margin. Other times these codes were used as the appropriate answer to a narrative question.

DEL -- Deleted by author as revealing the participant
 INF -- Infinite, continuous, too numerous to list
 N/A -- Not applicable (on this project), didn't use
 OTH -- Other
 UNK -- Unknown (also included "?" as an answer)
 VAR -- Variable
 MIS -- Question not answered (supplied by author)
 YES -- Yes or true

Upon occasion the author felt it necessary to either answer the question for the surveyee, or change his answer. In the interest of honest reporting, the following codes indicate whether or not the answer was changed/contrived and the reason. These change codes were C01, C02, and C03. C01 has the highest probability that the changed answers reflect the true answer, C02 next highest probability, and C03 the lowest probability. The change codes follow:

C01 -- This answer was supplied by the author and the answer chosen was based on an answer to a different question, e.g., if the survey answered Question 3 with answer b, and he did not answer Question 21, answer 21y was provided by the authors as C01. Again, if the surveyee answered Question 24A but not 24B, answer 24By was coded C01 by the author.

C02 -- These answers were manufactured by the author by compartmentalizing answers provided originally in narrative form, i.e., multiple choice answers were formulated after all the answers were supplied by the participants. These answers were originally in narrative type questions or answers provided under "comments" or "other." An exception to this was when the participant wrote in "none" or another negative comment because a "none of the above" type answer was not supplied by the author. When this happens a "none" answer is manufactured but coded C01.

C03 -- These answers were redirected by the author from the one given by the surveyees as "other" or "comment" to one of the existing answers which the author felt was equally as good as the one placed in "comment". This was done to reduce the number of possible answers while still retaining as much accuracy as possible.

TYPE TWO AND TYPE THREE CODES

This section reflects the specific codes and comments concerned with each question and are ordered by the question number. If there is no code or comment necessary for a given question, it is skipped.

2-5 Questions 2 through 5 are related. If any of these questions were answered "none" or "not applicable" and any of the other questions were not answered, answer y was coded C01.

4 The following codes were used in answering this question (these same codes were used for Questions 5, 24, 28 and 29). When there appears to be a large number of identical positions that position is coded into the z answer.

Senior Corporate Officers

VDR -- Director of Very Large Organizations
 VOP -- Vice President, Operations
 VPC -- Vice President, Data Processing
 VPE -- Vice President, Engineering/Function/Area
 VPG -- President or Vice President, General
 VPO -- Vice President, Organization of Physical Location

Senior Management

MCN -- Center Manager
 MCP -- Senior Manager, ADP
 MDR -- Senior Director
 MEN -- Senior Manager, Engineering/Functional Area
 MGR -- Senior Manager, General (includes Division Manager)
 MLB -- Laboratory Manager
 MPA -- Assistant/Deputy Program Director/Manager
 MPD -- Senior Program Director/Manager (as opposed to Project Manager)

Project Management

PAM -- Project Administration
 PEN -- Project Engineer
 PMA -- Assistant Project Manager, Deputy Project Manager
 PMC -- Project Manager, ADP/Computer
 PME -- Project Manager, Engineering/Analyst
 PMR -- Project Manager
 PMW -- Project Manager/Software
 PTD -- Technical Director/Manager

Middle Level Management (Second Level Supervisor, Chief)

MAA -- Manager, Administration Applications
 MAD -- Manager, Administration
 MAS -- Assistant Manager
 MAT -- Manager, Advanced Software Technology
 MBA -- Manager, Business Applications
 MCD -- Manager, Computer Applications
 MCE -- Manager, Computer Engineering
 MEF -- Manager, Engineering Functions
 MGN -- General (unspecified) (Department managers)
 MIG -- Manager, System Integration
 MOS -- Manager, Operations
 MPC -- Manager, Project Control
 MSA -- Manager, Application Software
 MSC -- Manager, Scientific Applications
 MSD -- Manager, Software Development
 MSO -- Manager, System Software and Operations
 MSR -- Manager, Software Requirements
 MSS -- Manager, System Software
 MSW -- Manager, Software
 MTM -- Manager, Test

First Line Supervisor

FAN -- Systems Analysis Supervisor
 FAP -- Applications Supervisor
 FCP -- Chief Programmer
 FEN -- Engineering Supervisor
 FLS -- First Line Supervisors, General (includes group leaders, task leader, section head, technical leader, manager, supervisor, head, etc.)
 FOP -- Operations Software Supervisor
 FOS -- Operations Supervisor
 FPP -- Project Programmers

FSA -- Applications Software Supervisor

FSD -- Software Development Supervisor

FSE -- System Engineer Supervisor

FSS -- System Software Supervisor

FSW -- Software Supervisor

FTC -- Team Chief

FTM -- Test Supervisor

FUT -- Utilities Software Supervisor

Lead ADP Personnel (includes Senior, Lead, Senior Project, Chief, etc.,

ADP Personnel

LAP -- Lead/Senior Application Software Programmer/Analysis

LOP -- Lead/Senior Operation Software Programmer/Analysis

LPA -- Lead/Senior Programmer/Analyst

LSA -- Lead/Senior Analyst

LSD -- Lead/Senior Designer

LSP -- Lead/Senior Programmer

LSS -- Lead/Senior Systems Software Programmer/Analysis

LUT -- Lead/Senior Utilities Software Programmer/Analysis

Lead Engineer/Functional Personnel (includes Senior, Lead, Senior Project, Chief, Etc., Engineering/Functional personnel)

LSC -- Lead/Senior Consultant

LSE -- Lead/Senior Engineer

LSW -- Lead Software Engineer

ADP Personnel

CAN -- Analyst

CAP -- Application Programmer Analysis

CDA -- Data Base Analyst

CDI -- Digital Computer Analysis

CDS -- Data System Specialist

CDV -- Software Developer

CMS -- Software Configuration Management

COP -- Computer Operations

CPA -- Programmer/ Analyst
CPR -- Programmer
CSA -- System Analysis
CSN -- System Programmer Analysis
CSP -- Scientific Programmer
CSY -- Systems Programmer

Engineer/Functional Personnel

ECO -- Cognizant Engineer
ECS -- Computer System Engineer
EDG -- Designer
EDS -- Software Development Engineer
EIG -- Integration Engineer
ENG -- Engineer/Functional/Designer
ENS -- System Engineer
ENT -- Test Engineer
ESA -- System Analysis
ESP -- Engineering Specialist
ESS -- Systems Software Engineer
ESW -- Software Engineer

Supporting Staff

SAD -- Administration
SDA -- Data Aid
SLI -- Support Librarian
SPC -- Project Control

General (Unspecified Personnel)

WMT -- Member Technical Staff
WOR -- Worker, Individual, Staff

Other Positions

OCU -- Customer
OMG -- Management Analysis
OPI -- Pilot
OSS -- Senior Scientist

5 The codes used in answering this question are the same as for Question 4 plus:

DIR -- Direct Line from Senior ADP Manager to Project Manager

10 The budget year (when supplied) is shown as the last two digits of the year preceeded by a zero (e.g. 1971 is coded 071, 1975 is coded 075, etc.).

11-12 Questions 11 and 12 are related. If Question 11y is answered and Question 12 is not answered, 12y was coded C01.

14 The number of people were reported in units according to the following method. The number of people, $d(1)$, $d(2)$, $d(3)$, . . . , $d(n)$ can be represented by $d(1)$, $d(2) \times 10^{**R}$ where $R=N-2$, was coded on the listing as $d(1)d(2)R$.

16-18 Questions 16 through 18 are related. If any of these questions were answered "none" or "not applicable" and any of the other questions were not answered, answer y was coded C01.

20-21 Questions 20 and 21 are related. If Question 20b is answered and Question 21 is not, answer 21y was coded C01.

24 The codes used in answering this question are the same as from Question 4 plus:

SAM -- The same as the question

28-29 The codes used in answering these questions are the same as for Question 4.

30 The following codes were used in answering this question. These are divided into 1) manufacturing codes and 2) software name. The software name was sometimes a proper name and sometimes a generic name.

Manufacturing Codes

ADR -- Applied Data Processing

CDC -- Control Data Corporation

CFG -- Cain, Farber and Gordon

CSC -- Computer Science Corporation

DEC -- Digital Equipment Corporation

FED -- Federal Simulation Center

FST -- Foresite, Inc.

HAC -- Hughes Aircraft Company
HPK -- Hewlett-Packard Corporation
IBM -- International Business Machines
IDP -- Inovation Data Processing
INH -- In-house
ITI -- Illinois Technology Institute
KFT -- Kearfott
MRI -- MRI
NAN -- NANODATA, Inc.
TRW -- TRW, Inc.
UNI -- Sperry-Univac Corporation

Software Name Codes

AFL -- Automatic flow charter
ALL -- All that are Available
APT -- APT
ASS -- Assembler
BUG -- Debugger
CFM -- Configuration Management
COM -- Compiler
CSS -- CSS-II
DOC -- Documentor
DSL -- Design language
EAL -- Edit and load
EMU -- Emulator
ESC -- ECSS
FLI -- FLIT
FST -- Foresight
FUR -- FURPUR
GEN -- General tools
HIF -- HIFTRAN
IMS -- Information Management System
INT -- Intercom

LIB -- Library Aids
MON -- Software monitor
MTH -- Math package
MUL -- Multivendor
NAS -- NASTRAN
NET -- Network generator
OPR -- Operating system
PDL -- Program design language
PRC -- Process construction
PRO -- Project Dependent
PRT -- PERT planning
RCT -- Requirement code/traceability
REQ -- Requirements Analyses
RFI -- Remote File Indicator
RTX -- Real time executive
SPR -- Structural preprocessor
SPX -- SPREDEX
SSW -- System software
STA -- Standards construction
SYG -- System generators
S20 -- System 2000
TET -- Test tools
THR -- Threads Management System
TPN -- TPNS
TRL -- Translator
TSO -- TSO data set editing
TXE -- Test editors
UTL -- Utilities

31-33 Questions 31 through 33 are related. If any of these questions were answered "none," "not applicable," or "no" and any of the other questions were not answered, Question 31 would be answered "N/A," and Question 32b and 33y would be answered C01.

32 The following codes were used to answer this question.

CNG -- Consultant Group
DPR -- Data Processing
EVG -- Software Evaluation Group
FSS -- System Software Supervisor
OUT -- Outside Organization
PTD -- Technical Director
SQA -- Software Quality Assurance
SWS -- Software Science
SWT -- Software Technology Group
SYS -- Systems Group

33 The following codes were used to answer Question 33b1. Answer to 33b2 was used only if two languages are reported.

ASS -- Unspecified Assembler
COB -- COBOL
FOR -- FORTRAN
JOV -- JOVIAL
PL1 -- PL/1

34 The codes used in answering this question are the same as for Question 30.

36 The following codes were used to answer this question:

COR -- Core requirements per program
CPU -- Computer usage per run
DRP -- Discrepancy report
KBU -- Number of known bugs
LOC -- Lines of codes (per time/dollar etc.)
MPT -- Manhouse per instruction (completed task)
NCT -- Number of compiles per task
NCU -- Number of compilable units
NSM -- Number of schedules met/jobs completed

PDO -- Pages of documentation
 RES -- Response time (on-line terminals)
 RWC -- Rate aided work charting
 TAT -- Turn around time
 TBZ -- Table sizes
 TTC -- Time to complete task

37-40 Questions 37 through 40 are related. If any of these questions were answered y ("none") and not all of the other questions were answered, answer y was coded C01.

43 The following codes were used in answering this question:

For Parts a and b the same method as for Question 10.

For Parts c and d the number represents the percent.

For Part e

INC -- Increase
 DEE -- Decrease
 STY -- Steady (no change)

Type Four Codes

45 The following codes were used in answering this question:

- B01 Freedom to change own product line hardware to benefit software.
- B02 Provide simulated hardware interfaces early in design software groups - participates in design of acceptance test devices.
- B03 We are systems management oriented and sincerely believe that the same discipline which applies to the management of hardware development are applicable to software development.
- B04 The use of a software integration to integrate the functional equations (i.e. controls, guidance, etc.) into a Part I specification which takes target computer architecture and subsystem architecture into account.
- B05 Existing configuration control system for hardware has been adapted very effectively for software control.
- B06 Close/early coordination between engineering and software development personnel.
- B07 Use of a system integration test start to integration and test hardware and software before starting test of the system in the vehicle. This qualifies the software for flight use.
- B08 Engineering discipline.

Appendix D

NARRATIVE AND CANDID (CLEAR TEST) ANSWERS TO SELECTED QUESTIONS

INTRODUCTION

This section deals with actual, unaltered, answers provided to a series of narrative response questions, specifically, Questions 1, 2, 3, 4, 5, 24, 28, 29, 30, 32d 34 and 36. The narrative response questions asked for answers for which the author could not provide a set of answers, because of the wide variety of possible answers. Each discernible response, whether included in the following pages or not, has also been analyzed and coded to facilitate entry in the tabulation listing in Section 2. Since this reduction of comment to code destroyed some of the understanding, the author felt it worthwhile to include this "verbal" section in the report.

The answers as they appear in the following pages have been "cleaned up" to assure anonymity from the standpoint of author, firm, and project. Identical or nearly identical responses have been eliminated. With the exception of the "clean up" and correction of the most obvious spelling and punctuation errors, those responses included in the following pages are as received, and though they do not in every instance answer the question asked, they relate to the subject. As an aside, the author makes no claims to total understanding of every response.

QUESTION 1 What position do you hold in the company?ANSWERS

The following answers are the various titles of personnel who answered the questionnaire (grouped as to their relationship to the company).

- a. Senior Corporate Officer
 - President
 - Assistant associate administrator for center operations (systems management)
 - Vice president of operations division
 - Assistant to the director
- b. Senior ADP Officer
 - Chief, data processing
 - Branch chief
 - Chief, data computation
- c. Senior Functional Area (Non-ADP)
 - Director, mission control and data processing
 - Director of engineering
- d. Project Manager Software Development
 - Manager, mini/micro based systems department
 - Senior scientist, computer programming lab, ground systems group
 - Group supervisor
 - Software Systems program manager
 - Manager, operations, computer systems division
 - Software group leader
 - Program engineer for data systems
 - Engineering group head - software development
 - Supervisor of automatic test software section
 - Engineering software supervisor
 - Software engineer
 - Assistant chief engineer for computer resources
 - Laboratory manager
 - Engineering management
 - Manager, software development

Group engineer

Manager - product programming and development

Manager - software development laboratory

Manager - computer subsystems design

Manager, plans and control, data processing systems, system technology program

1st level manager

Chief engineer, digital computer and software engineering

Manager

Manager, software systems operations

Command and control manager

Department manager

e. Technical Director, Quality Assurance, etc.

Director, quality assurance

Technical director

f. Senior Corporate Staff

Applied mathematician

g. Project Individual

System analyst

Project individual

QUESTION 2 What is the title/position of the senior ADP officer in the firm?

ANSWERS

The following are the various titles of personnel listed on the questionnaire (grouped as to their relationship to the company).

a. Corporate Officer

President

Vice president/general manager system engineering and integration division

Division president

Vice president of operating division

Vice president - software engineering

Vice president, aerospace systems

Vice president and director, computer systems division

b. Chief, Data Processing

Chief, data processing

Manager of software engineering

Manager of software development

Chief, digital computations

Manager, software development laboratory

Director, avionics control and information system

Director, data processing subsystems

Manager, business information system

Director of data processing

Director

Chief, computation division

Head, data processing center

Corporate director

Manager, information systems operations

Director, information processing

Manager, data systems services

Section head, computer programs

Department Head

Manager of engineering programming and computation department

Manager of programming and computation department

Director, administration

Director of computing and data processing

Division chief

Manager, information systems and computer services

Assistant director for automatic data processing

Software group leaders

c. Assistant Comptroller

Assistant associate administrator for center operation (systems management)

Assistant comptroller

d. Functional Area, Software Analysis

Software engineer

QUESTION 3 What is the title/position of the individual to whom the senior ADP officer reports (e.g., president, comptroller)?

ANSWERS

The following are the various titles of personnel listed on the questionnaire (grouped as to their relationship to the company).

a. Corporate Officer

President

Vice president and general manager

Group vice president of parent organization

Vice president, engineering

Vice president, systems technology program

Vice president, finance

Senior vice president - technical operations

b. Comptroller

Comptroller

c. Senior Functional Area (non-ADP)

Director of engineering

Assistant manager, engineering operations

Manager, engineering operations

Manager, finance

Director

Director for research support

Director western data center

Director, systems engineering

Assistant lab director

Division manager, finance

Director of mission and data operations directorate division chief

d. Senior Corporation Staff

Associate administrator, center operations

Chief, avionics engineering

Branch head

Data Analysts

Data processing engineers

Senior scientists

Manager, advanced programming staff

Manager, software engineering and technology department

Manager, program production department

Manager, air defense systems department

Manager, SURTASS programming department

Manager, software production department

QUESTION 4 What are the titles/positions of the individuals reporting directly to the senior ADP officer? (e.g., chief, Software Development Division)

ANSWERS

The following are the various titles of personnel listed on questionnaire.

Vice president
Manager, software systems operations
Manager, information processing operations
Center managers
Project managers
Manager, software requirements and analysis
Manager, software development
Manager, software test and development
Manager, software technology
Director, computer operations
Director, development
Director, systems integrity
Director, resources planning
Director, telemetry systems
Director, business development
Director, western operations
Director, project
Assistant to vice president
Staff assistant
Department managers
Manager, washington operations
Chief engineer, data control & processing subsystems
Project managers, software department
Director, management information system
Manager, plant engineering
Manager, office services
Chief pilot
Manager, administrative support center

Chief, management section
Chief, software development section
Chief, operations section
Director, ADP resources
Director, distribution and management systems
Director, requirements and material control systems
Director, technical support
Director, stock control and distribution systems
Lead programmer, utilities
Lead programmer, applications
Lead programmer, operating systems
Supervisor, utilities
Supervisor, operating systems
Supervisor, applications
Supervisor, test software
Chief, systems and operations
Chief, digital applications
Assistant to chief, digital computations
Department managers
Programmers
System analysts
Manager, computer operations
Manager, software engineering
Manager, plans and control
Supervisor, scientific applications software
Supervisor, scientific applications programs
Supervisor, scientific applications operations
Supervisor, business applications software
Supervisor, business applications programs
Supervisor, business applications operations
Supervisor, business systems analysis
Supervisor, hardware planning
Chief, computer engineering
Chief, computer programming

Chief, computer systems
Chief, instrumentation development
Director, central
Director, western
Director, eastern
Chief, operations integration
Chief, management information systems software development
Manager, data processing division
Manager, scientific computing division
Manager, test data processing
Director, software department
Director, systems design
Manager, technology
Manager, operations
Software development staff
Operators
Chief, scientific applications branch
Chief, computer systems branch
Chief, computer operations branch
Chief, administrative applications branch
Chief of business systems
Chief of scientific/engineering data systems
Staff engineer
Unit head
Software supervisor
Sections chiefs
Mission operations computing division head
Information processing division head
Software engineers
Software group leaders
Director, ADP management office
Director, information systems office

QUESTION 5 What is a typical line of authority from senior ADP officer through Software Development Project Manager?

ANSWERS

The following are the various combinations of personnel and line of authority listed on questionnaire.

Laboratory manager; department managers; associate project managers

Vice president; operations director; program manager

Vice president; functional manager; project head

"Direct"

Division president; center manager; location manager; project manager

Vice president/general manager; manager, software systems operations; manager, large software project

Director; assistant director; project manager

Director, avionics control and information systems; chief engineer, data control and processing subsystems; manager, computer subsystem design; section chief, software design

Director; manager; branch chief, software development; section chief, programming function

Manager; supervisor; unit head; project manager

Automatic data processing officer; section head; worker

Corporate director; director; manager; chief; supervisor; project leader

Director; division manager, department manager; supervisor

Director, administration; director, management information system; manager system programming

Chief, data automation; chief, software development section; chief, products unit; software development project manager

Assistant comptroller; director, systems development; chief, development divisions; chief, development branches; software development project manager

Chief, digital computations; chief, digital applications; software development project manager

Software lab manager; department manager; section manager; software project manager

Division chief; branch chief; project manager

Chief; programmer

Section chief; group supervisor

General manager, business section; manager, programs section

Assistant director for ADP; director of missions and data operations
 directorate; mission operations computing division head; information
 processing divisions head

Chief, avionics engineer; software group leader; software engineer

Senior ADP officer; director, information systems office; chief,
 systems development division; project manager

SPO chief; chief engineer; technical advisor for computer resources;
 computer systems engineer

QUESTION 24 (Part I) If possible, outline the composition of a typical large development team as it would be employed in your firm. To place the team in context, a hypothetical project description may be included (e.g., development of an on-line air cargo manifesting capability).

Hypothetical project description (optional):

ANSWERS (Part I)

The following is a list of descriptions shown on questionnaire.

Develop a passive sonar system
 Computer-aided dispatch system
 Tactical command and control
 Development of an on-line manufacturing material system for generating working paper to the shop floor during aircraft manufacture
 Developing a crew training simulator system for a weapon system (e.g., aircraft weapons system)
 Facilities specifications for tactical
 Computer command and control plus intelligence
 Development of a submarine sonar system
 Uniform cost accounting
 Requirements computation
 On-line data collection
 Airborne avionic weapons system
 Develop a computer graphics oriented aircraft synthesis program
 Conf. for flight software
 Automating a world-wide network of tracking stations

QUESTIONS 24 (Part II) Fractions may be used to indicate that the position is not considered a full time job. The following is an example of the notation to be used if one individual occupies more than one position:

| | | |
|------------------|-------------------------|-------------------|
| f. Administrator | | $\frac{1}{3}$ (g) |
| g. Librarian | <u>DESIGN ASSISTANT</u> | $\frac{2}{3}$ (f) |

The letter in parenthesis is intended to tie the same individual to positions f and g.

Possible Title: a. Project Manager; b. Asst. Project Manager; c. Senior Analyst; d. Team Chief; e. Asst. Team Chief; f. Administrator; g. Librarian; h. Application Analyst; i. Functional analyst; j. Applications Programmer; k. Operation Systems Programmer, l. Tester; m. Integrator.

ANSWERS (Part II)

The following indicate typical development teams as shown in response to Question 24:

Project Manager, 1/3; Senior Analyst-Member of Tech Staff, 1/3;
Applications Prog-Members of Tech Staff, 3 1/3

Project Manager, 1; Technical Director, 1; Department Managers, 3;
Section Head, 7; Administrator, 1; Librarian, 1; Functional Analyst,
5; Applications Programmer, 20; Operation Systems Programmer, 5

Project Manager, 1; Assitant Project Manager, 1; Senior Analyst, 10-12;
Department Manager, 3-4; Administrator, 1-2; Application/Programmer
Analyst, 20

Project Manager, 1; Assistant Project Manager, 3; Work Package Manager,
6; Administrator, 1; Librarian, 1; Application Analyst, 5; Programmer/
Analyst, 15; Quality Assurance, 1

Computer Analyst; Computer Specialist

Project Manager/Director, 1; Manager, 2; Senior Designer/Engineer, 4;
Administration, 1/2; Application Analyst, 10; Applications Programmer,
30; Operations Systems Programmer, 5; Tester, 7.

Program Manager, 1; Deputy Program Manager, 1.

Program Manager, 1; Senior Analyst, 4; Administrator, 1; Application
Programmer, 8 (Programmers in testers and integrator).

Project Manager, 1; Assistant Project Manager, 2; Senior Project Analyst,
6; Project Analyst/Programmer, 5; Digital Computing Analyst/Programmer,
2; Digital Computing Analyst/Operator, 2.

Project Manager, 1/2; Assistant Project Manager, 1/2; Team Chief, 1/2;
Assistant Team Chief, 1/3.

Project Manager, 1; Assistant Project Manager, 1; Senior Analyst, 3;
Team Chief, 2; Assistant Team Chief, 2; Administrator, 1; Application
Analyst, 16.

Project Manager (cognizant engineer), 1; Assistant Project Manager
(cognizant programmer), 1; Application Analyst (engineer), 1/3 (i & 1);
Functional Analyst (engineer), 1/3 (h & 1); Programmers; Tester (engineer),
1/3 (h & i); Data Systems Integrator.

Program Manager, 1; Deputy Program Manager, 1; Systems Engineer
Manager, 1; Software Development Manager, 1; Work Unit Leader, 10;
Program Planner/Controller, 2; Configuration Management Specialist, 2;
System Engineer/Analyst, 8; Functional Analyst, 8; Applications Pro-
grammer, 10; System Test Engineer, 3; System Integration Engineer, 3.

Project Manager, 1; Assistant Project Manager, 1; Senior Analyst, 2;
Team Chief, 1; Assistant Team Chief, 1; Librarian, 1; Applications
Programmer, 3; Operation System Programmer, 2.

Section Head, 1; Data Analysts; Programmers; Data Processing Engineers.

Program Manager, 1; Project Engineer, 1; Tech Director, 1; Task Leader;
Administrator, 1; Programmers; Engineers.

Senior Analyst, 1; Administrator, 1/2; Applications Programmer, 2; Operation Systems Programmer, 2 1/2.

Project Manager, 1; Assistant Project Manager, 1; Senior Analyst, 1; Project Engineer, 3; Administrator, 2; Systems Engineers, 6; Scientific Programmers, 5; Hardware Engineers, 10.

Project Manager, 1; Lead Designer, 1; Chief Programmer, 1; Designer, 1; Programmer, 3.

Manager, 1; Assistant Manager, 1; Senior Systems Engineer, 4; Section Head, 2; Technical Staff, 3; Librarian, 4; Senior Programmer, 10; Programmer, 15; Software Test Engineer, 3.

Project Manager, 1; Technical Director, 1; Team Chief, 5; Administrator, 1; Librarian, 1; Application Analyst, 3; Functional Analyst, 3; Applications Programmer, 20; Operation Systems Programmer, 8; Tester, 5; Integrator, 5.

Project Manager, 1; Supervisors, 2; Senior Analyst (Team Leader), 3; Lead Programmer, 3; Data Aide (Documentation), 1 1/3; Librarian, 2/3; User Analysts (work for customer), 6; Applications Programmer, 15; System Integrator Leader, 1; Data Base Designer, 1; Data Base Administrator (Procedures, etc.), 2; Transition to Production Interface, 1.

Computer Systems Engineer, 1.

Senior Systems Analyst, 1; Management Analyst, 1; Systems Analyst/Programmer, 1; Program Analyst, 2; Systems Software Engineer, 1/4.

Project Manager, 1; Data Systems Specialist, 3; Senior Programmer Analyst, 6; Administrator, 1/2; Librarian, 1; Application Programmer/Analyst, 20; Operation Systems Programmer/Analyst, 8; Tester, 6; Integrator, 3; Documentation Aides, 3.

Project Engineer, 1; Senior Consultant, 1/3; Senior Engineer, 1; Librarian, 1 per 10 programmers; Programmer, 12.

Project Manager, 1; Assistant Project Manager, 1; Senior Analyst, 5; Applications Programmer, 20; Integrator, 1.

Project Manager, 1; Assistant Project Manager, 1; Team Chief, 3; Administrator, 1; Librarian, 1; Functional Analyst, 5; Applications Programmer, 8; Tester, 1.

Senior Analyst, 4; Application Analyst, 2.

Engineering Manager, 1; Project Engineer, 2; Project Leader, 3; Group Leader, 8; Administrator, 1; Software Engineer (Librarian), 1/2; Software Dev Engineer, 14 1/2; System Analyst (Application), 3; System Analyst (Functional), 8; System Analyst/Tester, 12; System Analyst/Integrator, 11; Staff Assistants to System Project Engineer, 2.

Project Engineer, 1; Engineering Specialist, 1; Supervisor, 1/2; Scientific Programmer, 5.

Project Manager/Software Engineer, 1; Senior Programmer, 2; Info Systems Analyst, 5.

Project Manager, 1/2 (1/2 supervising other work); Applications Programmer, 1; System Software Engineer, 2

Project Manager, 1; Assistant Project Manager, 1; Senior Systems Analyst, 2; Deputy Project Manager for Application Software, System Software, Data Base Development, Test and Evaluate, QA, Training, etc., 3-7; Administrator, 1; Librarian, 1; Systems Analyst, 4; Applications Programmer, 8; Tester, 6; Intregator, 6

QUESTION 28 Which Manual reporting procedures are used in project monitoring and management? At What level do they originate, and how high do they go? How often were they aggregated, condensed, or edited as they moved up the chain?

ANSWERS

| <u>Report Title</u> | <u>Lowest Originator</u> | <u>Highest Recipient</u> | <u>No. of AGGS/EDTS</u> |
|-----------------------------|--------------------------|--------------------------|-------------------------|
| Weekly Activity (Verbal) | Indiv worker | Proj mgr | - |
| Project Status (Verbal) | Indiv worker | Proj mgr | - |
| Significant Change (Verbal) | Indiv worker | Proj mgr | - |
| Weekly Activity | Task mgr | Dept mgr | 1 |
| Project Status | Task mgr | Div mgr | 1 |
| Significant Changes | Task mgr | Div mgr | 1 |
| Weekly Activity | Software engr | Data proc mgr | none |
| Project Status | Software engr | Proj mgr | 3 |
| Significant Changes | Data proc mgr | Proj mgr | 4 |
| Weekly Activity | Worker | Customer | - |
| Project Status | Lead Prog | Chief, ADP | - |
| Significant Items | Senior Prog/Anal | Prog mgr | - |
| Performance Measuring Sys | Work package mgr | Customer | 1 |
| Variance Report | Work package mgr | Customer | 1 |
| Weekly Activity | Team ldr | Asst dir | 2 |
| Project Status | Supervisor | Director | 2 |
| Significant Change | User dept | Ch rev board | 1 |
| Crab Control Status | Test team | Carb cont bd | 1 |
| Design Review Report | Review team | Vice pres | - |
| Financial Report | Proj mgr | Vice pres | 1 |
| Weekly Activity | Ind contrib | Div gen mgr | 6 |
| Project Status | Ind contrib | Div gen mgr | 6 |
| Significant Change | Prog mgr | Div gen mgr | 4 |
| Monthly Activity | Programmer | Chief ADP | 2 |
| Project Status | Proj mgr | Chief, Organ | 4 |
| Weekly Activity | Group engr | Director | 2 |
| Weekly Activity | Section | Proj mgr | 1 |
| Project Status | Proj mgr | President | 2 |
| Weekly Activity | Programmer | General mgr | 3 |
| Project Status | Programmer | General mgr | 3 |
| Significant Change | Programmer | Software mgr | 2 |

| <u>Report Title</u> | <u>Lowest Originator</u> | <u>Highest Recipient</u> | <u>No. of Aggs/Edits</u> |
|---------------------|------------------------------|------------------------------|------------------------------|
| Weekly Activity | Prog/Engr | General mgr | 3 |
| Project Status | Lead prog | General mgr | 3 |
| Significant Change | Lead prog | Dir of engr | 2 |
| Weekly Activity | Analyst/Prog | Proj mgr | 2 |
| Project Status | Analyst/Prog | Proj mgr | 2 |
| Significant Change | Analyst/Prog | Proj mgr | 2 |
| Weekly Activity | Programmer | Proj engr | - |
| Project Status | Proj engr | Div mgr | 2 |
| Weekly Activity | Engineer | D P Dir | - |
| Project Status | Engineer | Director | - |
| Significant Change | Engineer | Director | - |
| Weekly Activity | Lead engr | Proj mgr | 4 |
| Project Status | Software mgr | Proj mgr | 2 |
| Significant Change | Software mgr | Proj mgr | 2 |
| Weekly Activity | Prog/Analyst | Proj mgr | - |
| Project Status | Prog/Analyst | Proj mgr | - |
| Significant change | Prog/Analyst | Proj mgr | - |
| Weekly Activity | Indiv prog | Proj mgr | 2 |
| Project Status | Proj mgr | Center mgr | 5 |
| Project | Proj admin | Varied | - |
| Weekly Activity | Programmer | Proj mgr | - |
| Project Status | Proj prog | Proj mgr | - |
| Significant Change | Proj prog | Proj mgr | - |
| Weekly Activity | Staff | Prog mgr | - |
| Project Status | Task leader | Customer | 1-2 |
| Significant Item | Senior | Mgr | - |
| Weekly Activity | Proj mgr | Vice pres | - |
| Project Status | Lead prog | Vice pres | 3 |
| Significant Change | Proj mgr | Vice pres | - |
| Weekly Activity | Unit head | Director | 3 |
| Project Status | Programmer | Proj mgr | 2 |
| Weekly Activity | Programmer | President | 5 |
| Project Status | Lead prog | President | 4 |
| Weekly Activity | Sr analyst | Dir MIS | ? |
| Project Status | Dir mis | Dir admin | ? |
| Significant Change | Dir mis | Dir admin | ? |
| Weekly Activity | MTS | Proj mgr | - |
| Project Status | Proj mgr | Asst vp | 1 |
| Significant Change | Proj mgr | Asst vp | - |

| <u>Report Title</u> | <u>Lowest Originator</u> | <u>Highest Recipient</u> | <u>No. of AGGS/EDTS</u> |
|---|------------------------------|------------------------------|-----------------------------|
| Weekly Activity | GP head | Prog mgr | 2 |
| Project Status | GP head | Prog mgr | 2 |
| Significant Change | Section head | Prog mgr | 1 |
| Project Status | Cog engr | Sect chief | 1 |
| Significant Change | Cog engr | Sect chief | - |
| Contract Progress Schedule Report - Semimonthly | Proj dir | ISO director | 0 |
| Key punch Activity and Xerox Utilization Report - Monthly | Oper mgr | Oper chief | 0 |
| ADP - Daily Operational Report | Oper mgr | Oper chief | 0 |
| Financial Management Report | Proj mgr | ISO director | 0 |
| Administrative Status of Work Orders | Prog level | ISO director | 2 |
| Weekly Significant Activities Report | Proj leaders | ISO director | 0 |
| Analysis - Government - owned/Contractor Held Property | Proj mgr | ISO director | 0 |
| Contractor Organization and Personnel Report | Proj mgr | ISO director | 0 |
| Equipment Maintenance Records Report | Manufacturer's engineer | Oper chief | 0 |
| Commercial Time Share Activity Report | Proj mgr | ISO director | |
| Privacy Act - Contractor Personnel Access List | Proj mgr | ISO director | 0 |

NOTE: ISO - Information System Office

QUESTION 29 Which automated reporting systems were used in project monitoring and management?

ANSWERS

| <u>System</u> | <u>Lowest Originator</u> | <u>Highest Recipient</u> |
|-------------------------------|--------------------------|--------------------------|
| Manhour/Activity | Programmer | Chief, ADP |
| Manday/Task | Programmer | Chief, ADP |
| Manhour Accounting | Programmer | Chief, ADP |
| Manhour/Activity | Lead Engr/Prog | Director |
| Manhour/Activity | Analyst/Prog | Project Mgr |
| Manday/Task | Analyst/Prog | Project Mgr |
| Manhour/Activity | Librarian | Dept. Mgr |
| Manday/Task | Programmer | Project Mgr |
| Manhour/Activity | Software Engr | D P Mgr. |
| Manday/Task | SR Programmer | Software Engr |
| Manhour/Activity | Engineer | Manager |
| Manday/Task | Engineer | Manager |
| Manhour/Activity | Worker | Section Head |
| Manday/Task | Varies | Varies |
| Cost Data (Time cards) | Indiv | Div Mgr |
| Manhour/Task | Prog/Analyst | Project Mgr |
| Accounting System | - | - |
| Manday/Major Project Task | All Echelons | All Echelons |
| Manday/Task | Staff | Project Mgr |
| Manhour/Activity | Admin | Manager |
| Cost-Schedule-Controll-System | Worker | Customer |
| Manday/Task | Lead Prog | Proj Mgr |
| Manhour/Activity | Lead Prog | Proj Mgr |
| Manhour/System Function | Indiv Contributor | Proj Mgr |
| Manhour/Activity | Programmer | Chief, ADP |
| Pert Analysis | - | - |
| Manhour/Activity | Individual | The whole world |

| | | | |
|---|--------------------|------------------|---|
| Tape/Disk Pack Library Report | Tape Librarian | Operations Chief | 0 |
| Daily Computer Utilization Report | Operations Manager | Operations Chief | 0 |
| Monthly Summarization of Computer Utilization Report (JARS) | Operations Manager | Operations Chief | 0 |
| Work Order Status Report (RMAS) | Programmer Level | ISO Director | 0 |
| Monthly Computer System and Services Usage Report (RMAS) | Programmer Level | ISO Director | 0 |
| Labor Distribution Report (RMAS) | Programmer Level | ISO Director | 0 |
| Periodic Resource Utilization Summary | Programmer Level | ISO Director | 0 |

NOTE: ISO- Information Systems Office

QUESTION 30 Which commercial, or what locally developed software was employed to assist in the development task? (e.g. LIBRARIAN, Applied Data Research) (If system was of local origin, give very brief description, e.g. structural pre-compiler, automatic flow chart, etc)

ANSWERS

| <u>NAME</u> (or description) | <u>VENDOR</u> (or description) |
|----------------------------------|--------------------------------|
| Threads Management System | CSC (V & V Tool) |
| Automatic Flowcharter | CSC |
| CMS-2 Structured pre-processor | |
| SHARE -7 | USN |
| DEBUG | Fortran Debugger |
| DOCTOR | Fortran Source Documentation |
| FORFLO | Fortran Flow Charter |
| FORESIGHT | Forsight, Inc. |
| PERT/EXPERT | Planning package |
| MPS LIB II | Source edit & loader |
| SYM - II | Assembler |
| IMSL LIBRARY | Internal matl/Stat Library |
| NASTRAN | CSC |
| APT | ITI |
| Structured Pre-compilers | IBM |
| Requirement Language/Analyzer | TRW, Univ of Michigan |
| Prog Definition Language | CAINE, FARBER, & GORDON |
| Requirements - Code Traceability | TRW |
| Configuration Management | TRW |
| Process Construction | TRW |
| Standard Auditor | TRW |
| Timeshare/Text Editor | TRW |
| TESTS TOOLS | TRW |
| SPREDEX | CSC |
| CSS - II | IBM |
| ECSS | FEDSIM |

| <u>NAME</u> (or description) | <u>VENDOR</u> (or description) |
|---|---------------------------------------|
| Various Cross Assemblers are compilers | In-house |
| TSO Data Set Editing | IBM |
| Library Support Aids | IBM |
| Fortran Pre-processor | Competative |
| Text Editors | In-house |
| Flow Charters | In-house |
| Compilers | In-house |
| TSO/CRS/ATMS II/MVS | IBM |
| Cobol Compiler and library | IBM |
| Fortran Compiler and library | IBM |
| CVE/P-K/LAV | Boole & Babbage |
| EDR/DSP | Innovation Data Processing |
| System 2000 | MRI |
| Psytran | - |
| IRS | Sigma Data Computing Corp |
| Stat Programs for Social Science | SPSS, Inc. |
| Remote File Inquiry | Kennedy Space Center/IBM |
| Emulator | Emulate INTEL 3000 or 8080 |
| Impact | Program activity network generator |
| Auto Flop/Flow Charter | In-house |
| WYLBUIZ/Text Ed/For | IBM |
| Info Management System | IBM |
| Social Compiler System | Hughes |
| CMS-2 Support System | UNIVAC |
| HIFTRAN | HAL Pre-processor for IFTRAN |
| SPDL | Design language |
| SFTRAN, RATFOR, FORCE | Fortran pre-compilers |
| TIDY, INDER, FURPUR | Utilities processors |
| SSG | |
| BTS, MFS | IBM |

NAME (or description)

TPNS

FDR

IMS IN?IRE

Librarian

Data Catalog

Mark IV & Mark IV-IMS
BridgeVENDOR (or description)

IBM

Innovation Data

CGA

ADR

Synergistics

Infomatics

QUESTION 32a Did the firm have a special organization or group that aided the project manager in selecting software development aids/packages?

ANSWERS

Title:

Software Quality Assurance Section
 Software Sciences
 Data Processing
 Computer System Engineering Branch
 Tech Advisor for Computer Systems
 Software/Hardware Evaluation Group
 Corporate Systems
 User Consultant Group
 Data Base Technology Group
 Software Technology Group
 Director Tech. Support

COMMENTS:

Funded by R & D and projects
 Occasionally assisted by another company division
 Assistance available on voluntary basis from Data Processing Center
 Individulas have own ADP "assets"
 Informal Group

QUESTION 34 Which Software Development aids (e.g., copy library) supplied by the hardware manufacturer did you use to assist in application system development?

ANSWER:

| <u>NAME</u> | <u>MANUFACTURER</u> |
|--------------------------------------|-------------------------------|
| Assembler/Loader | Kearfott |
| Emulator/Simulator | Kearfott |
| FURPUR | Univac |
| Fortran Libraries | Univac |
| FLIT | Univac |
| ALL | DEC PDP-LD Operative System |
| ALL | CDC CYBER |
| QM-1 Emulators | NANODATA |
| Compilers, Assemblers, Math Routines | CDC |
| INTERCOM | CDC |
| IMS | IBM |
| ALL | Multiple |
| All Available | |
| Many | IBM, CDC, UNIVAC, DEC, OTHERS |
| Systems Software | IBM |
| Documentation | CDC |
| Packages | |
| CSS-II | IBM |
| ECSS | FEDSIM |
| Various Cross Assemblers & Compilers | Mostly in-house |
| TSO Data Set Editing | IBM |
| Library Routines | IBM |
| Standard | OS and utilities |
| Fortran | |
| Editors | |
| DeBug | |

NAMEMANUFACTURER

| | |
|------------------------------|----------------------------|
| Sys Gens, Memory Maps, Dumps | Innovation Data Processing |
| Fast Dump Restore | MRI |
| Sys 2000 DBMS (Not long) | Sigma Data Computing Corp |
| IRS | Kennedy Space Center IBM |
| RFI | Any |
| Text Editor | HP |
| O/S - RTE | IBM |
| O/S | Univac |
| CMS-2 M & V Support Package | IBM |
| IMS | IBM |
| TPNS | IBM |
| BTS, MFS | IBM |
| DB PROTOTYPE | IBM |

QUESTION 36 List manually derived productivity indexes such as lines of code, program errors, turn arounds required per completed task, etc., that you employed in monitoring performance.

ANSWERS:

Lines of code

Time to complete program module

Number of compilable units

Manhours/Instruction

Factors for type SW

Real time application

Support SW, compilers

Assy's

Discrepancy reports

Computer usage for checkout

Turn around time

PP time

CA time

Response time (on line terminals)

Number of known bugs

Core requirement changes for code

Lines of completed code generated

Number of complies/completed task

Number of manhours expended/completed task

Number of schedules met/completed task

Pages of documentation generated/completed task

Table sizes

2.5 compiles per program through implementation

Jobs processed per month/manhour

Test hours/programmer/month

Time to complete

Rate aided work checking

Dollars/lines of operational, documented code

L.O.C./unit time

Lines of code should not be used in monitoring performance



CALIFORNIA STATE UNIVERSITY. SACRAMENTO

6000 J STREET, SACRAMENTO, CALIFORNIA 95819

August 1, 1981

TO: Participants in the AIAA Project Management Survey

Enclosed is SM-ALC/MME TR 79-54, Volume I, dated 18 Dec 1979, which reduces and formats data from the survey in which you participated. A limited number of copies were printed and generally only participants in the survey are sent a copy of this data. In addition, a copy of this report and the machine listing of the data will be forwarded to:

RADC/ISISI
GRIFFISS AFB, NY 13441

(315) 336-0937
AUTOVON 587-3395

for retention in the RADC Data & Analysis Center for Software. This is the last volume in the report and one of the more interesting. Data from this volume has never been used in any paper or report.

A paper using data from Volume II will be published in the July issue of The IEEE Transactions on Software Engineering. Another paper from Vols. II and III will also be published in the Transactions next spring. A companion paper "The Challenge of Software Engineering Project Management" was published in Computer, August 1980. A paper "Organizational Structures Used in Software Development by the U. S. Aerospace Industry" which used data from Volume II was published in The Journal of Systems and Software 1, 283-297 (1980). And lastly, Art Pyster from the University of California at Santa Barbara and I are working on a project management reference book entitled The Pitfalls of Software Engineering Project Management: In Defense of the Project Manager, that will use the project management data along with other information.

Arthur Pyster, UCSB, and I are still soliciting professional level papers on the practical aspects of software development and project management to be published in a special issue on project management in the Software Engineering Transactions, Spring 1982. If you have such a paper or are interested in writing one, please contact the editor, IEEE Transactions on Software Engineering, Les Belady or myself.

Since this is probably the last correspondence you and I will have concerning the AIAA Project Management Survey, I want to thank you most heartily for your support over the past four years. If you have any comments or questions, you can contact me at home (916) 481-5482 or at the University (916) 454-6834.

Sincerely,

Richard H. Thayer, Ph.D.
Lecturer in Computer Science

Encl.
THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

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